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Agriculture.

CULTIVATION OF BROOM CORN.

The cultivation of broom corn is one of the features of rural work which is necessary to have in mind, particularly as it sometimes happens that some swift-maturing crop is required as a catch crop in between seasons.

Broom corn can be sown from July to January with safety; the early sown crop will mature in about four months, when the stalks can be chopped or mown down and another harvest gathered before winter frosts cut the stalks. To successfully cultivate, the land should be in a fine tilth, so as to enable the tender shoots to germinate without obstruction.

Seed should be sown in drills 3 feet 6 inches apart, and sufficient seed sown so as to allow plants at the rate of 3 to every foot of drill when thinned out. Every care should be taken to have the land free from grass and weeds, otherwise, as the millet is in its young stage of very slow growth, any weeds or grass latent in the soil, if the weather is propitious, will outgrow the broom corn and render hoeing a more difficult operation, and perhaps so outgrow the crop, thus making it expedient to resow.

Care must be taken not to sow the seed too deeply; 1 to 1½ inches is advisable. Seed is sometimes sown with the corn-planters—this is the most economical method. If sown by hand, the cost is rather higher, as it requires a drill to be opened and further labour to cover the seed. The machine combines these processes, and economically and swiftly performs the sowing.

From 6 to 10 lb. of seed per acre is enough to use if the germinating quality is good. Scuttling and hoeing to keep down weeds are the chief matters to attend to.

When the brush is forming, some attention must be given to bending the brush. It is not necessary to bend all the heads, as for the most part only the very vigorous and heavy tops will need bending.

To bend without breaking off the top is an art which must be acquired. It is easily done if care is taken to pinch the succulent stalk-head some 12 inches or so below the brush and deftly twist the head over. This, if done properly, will not arrest the maturing of the brush.

When the whole crop is considered ready, the cutters, using a sharp table or other suitable knife, pass along the rows, cutting the head off, leaving about 6 or 8 inches of stalk.

The heads are piled in every other row, heads and stalks in line, so as to facilitate handling. They are then brought in to the barn or drying-bench and allowed to dry, so as to permit stacking away prior to threshing of the seed. Care must be taken not to put away the brush in an undried condition, as it will speedily mould and its value be destroyed. The seed is next taken off, either by means of a peg-drum thresher or other contrivance. The brush is then baled, and is ready for the factory.

The value of good broom corn ranges from £22 to over £30 per ton, according to quality. Brush left to seed heavily is frequently injured in quality. The finest brush is that cut before the seed is filled. In this case the grower loses the use of the grain, which is a matter he needs to consider.

WILD OATS.

There can be no doubt that where wild oats are plentiful on the farm the annual loss to the wheat-grower is considerable, because two plants cannot grow on the same spot, and, if the oats have possession, then the yield of wheat must necessarily be lessened. Some time ago we saw a field on the

Downs which appeared to consist half of wild oats. The owner said that if wheat were dear this would be a wheat field, but if oats were dear it would be an oat field. The losses due to the alarming spread of wild oats in America and Canada have been so enormous in the way of lessened yield of wheat, lower grades, and rejected grain that united effort for the eradication of the pest has become imperative. Writing on this subject in the "Nor' West Farmer," a Canadian farmer says:—

Farmers and grain-dealers alike recognise the dangerous character of wild oats, and explanations as to how they are introduced and spread are freely offered, but a sure and practical method of eradicating them when once they become well established in the land is difficult to get. It is clearly a case where prevention is easier and better than cure, and those who now have new land free from the pest should take warning and use every means to keep their land clean.

It is obvious that if wild oats are never scattered on the land they cannot contaminate it, so in the utmost care in the selection of pure seed is found the first great preventive. Another source of infestation is the feeding of whole oats that may contain some of the wild variety to horses working on the land. Some of the wild oats may not be thoroughly digested, and will grow when they become buried in the ground. Another source of danger is the threshing machine. When moving from one farm to another, foul seeds are often carried, and it is sometimes very hard to prevent contamination in this way. About the only thing that can be done is to insist that the machine be well cleaned out before it is stopped, previous to moving to your farm, and it is also well to take particular pains in looking after the first few bushels of grain that come from the machine when it first starts up.

A METHOD OF ERADICATION.

But while preventive means are the best they do not solve the problem for the man who already has his farm badly infested, and who is seriously trying to get rid of the pest. The eradication of wild oats is no doubt a difficult proposition, and can be accomplished only by a carefully planned system of cultivation followed for a number of years; but it would appear as though it could be done, and with little or no loss of crop, if it is gone about in the right way.

One of the best plans that I have had suggested is that proposed by James Strang, a very successful farmer of the Baldur district. The method of eradication as outlined below is the one which Mr. Strang is using himself, and, as it appears to be a good one, I would recommend others to give it a trial.

The oats, of course, are propagated only by seeds, and, consequently, the whole object of the cultivation is to germinate all the seeds in the ground. The first step in this direction is to disk the ground in the fall, or as soon as possible after cutting is done, thus covering the seeds on the surface and giving them a chance to sprout. This is an important step, and one that is often neglected. In the spring Mr. Strang's proposition is to cultivate the ground until fairly late in the season, and seed early with barley. By this means oats near the surface will be germinated and destroyed before the barley is put in, and if any do escape and grow with the crop they will likely be cut before the seed is mature enough to grow. This method has been followed with more or less success, but it has been found that one season of such treatment will not destroy all the oats, as many of the seeds will remain dormant in the ground. To make the job more complete, Mr. Strang is going to repeat this treatment another year, and then follow by a summer fallow in the third season. During the three seasons he hopes to germinate all the oats that are in the ground without giving them a chance to grow and ripen, and if this can be done the eradication will be complete.

Of course I am not prepared to say that this is a positive, guaranteed cure, as it has yet to be thoroughly tested, but it is certainly working on the

right principle, and if the work as outlined is well done the wild oats should be very few in the crop following the summer fallow. It may be objected by some that they cannot afford to grow two crops of barley in succession, as they want to use the land for wheat. Of course, barley is not as profitable a crop as wheat, if the grain is to be sold, but many of our farmers who are now growing wheat almost exclusively would find it profitable to devote more land to barley and sell the grain in the form of live stock. The growing of two crops of barley in succession would not constitute a loss, but, on the contrary, would perhaps encourage the live-stock industry of the country, and if it did that as well as help eradicate the wild oats it would, indeed, be "twice blessed."

TOMATOES.

There are not many fruits which can be utilised in so many ways as the tomato. It can be eaten raw or as a salad; it can be made into jams, jellies, chutney, and sauce; it can be stewed, fried, canned, stuffed with rice and force-meat, and is excellent in pies and puddings. One of its great virtues is that the plant thrives in any part of the State. It is found growing wild in the neighbourhood of abandoned homesteads; and, although it deteriorates in size when not cultivated, still the fruit is very acceptable to the thirsty traveller. By judicious selection and careful cultivation, the fruit has been brought to great perfection by market gardeners in Queensland. Adaptable as the plant is to the whole of Queensland, yet its cultivation demands different methods in different districts. For instance, in some parts it is very advantageous to grow it on trellises or train it to stakes. One good plan is to make a rough framework round the plants, and cover the top with wire netting. The vines grow through the netting, and the fruit is found above it, so that it lies where it is protected from insect pests and from contact with the soil. These methods should be adopted wherever wet seasons predominate, as, for instance, on our Northern coast lands. By this means the sunlight and air are let in, thus checking many diseases, and the gathering, spraying, and pruning are much facilitated. Such methods, however, are not suitable for the drier Western districts. The tomato is very susceptible to cold, and frosts in the West are often very severe, and, to be successful there in tomato culture, considerable trouble has to be taken to raise young plants.

Mr. Henry Tardent, who was particularly successful in this work in the West, advised the making of a hot bed, either permanent with furnaces and flues or temporary. This bed should be 40 or 50 feet long, by 5 or 6 feet wide, surrounded by a wooden framework, about 2 feet deep at the back, slanting down to a shallower depth in front. Fill the framework with light soil, and the hot bed is ready for the production of seedlings. A canvas cover should be provided to cover the bed during the nights and cold days, and it can be rolled up during the warm hours of the day.

The tomato is rather difficult to transplant successfully, unless a good lump of earth can be retained round the roots. A very good way to effect the transplanting, and one by which Mr. Tardent was able with certainty to get 100 per cent. of strikes, is to make a number of galvanised-iron cylinders from strips of iron about 10 inches by 3 inches without soldering, or, simpler still, take old jam or Swiss milk tins, throw them on a fire to melt off the soldering, and they are ready for use. Put these cylinders into the hot bed; shake on them through a sieve some rich, light loam mixed with well-rotted manure or vegetable mould. When they are filled within half an inch of the top, drop in the middle of each tin one tomato seed; then fill up until the soil is nearly level with the top of the tins, and give a moderate sprinkling of lukewarm water. Then during the daytime make a moderate fire in the furnaces, so as to get up a temperature of from 50 degrees towards the morning to 80 degrees in

the middle of the day. The plants will then be up in from three to five days. Husband well the moisture in the soil, but water very sparingly. Too much water makes the plants weak and lanky. In from four to six weeks they will be ready for transplanting.

A perfect tomato soil should be a deeply ploughed and subsoil sandy loam, well pulverised, and naturally or artificially well drained. The tomato, being a gross feeder, the soil in which to grow it can hardly be too rich, especially in lime, potash, and sulphuric acid. Too much ammonia, however, as is contained in fresh cow manure, induces a rank growth of the vine, which renders the plant liable to diseases.

When the land is reduced to a tilth as fine as flour, and when all danger of frost is over, then is the time to transplant.

Lift out the tins from the hot bed, place them in the holes prepared for them, draw the soil round it, then remove the tin. The plant has thus been put out without the slightest disturbance of the roots, and will, therefore, not cease growing from the start. Never transplant when the soil is cold, nor in windy weather, nor in the middle of a hot day. If the weather be very dry, give each plant a pint of tepid water. Should a late frost be feared, protect each plant with a covering of paper or bark. There is a simpler way of protecting the plants from frost. It consists in walking along the rows and pushing in front the hand hoe Planet Junior with the two mould-boards turned inside, thus covering every plant with a couple of inches of soil. They will stand it without injury for at least 48 hours. The uncovering must be done carefully by hand towards the evening of the following day.

During the three or four following weeks the work consists chiefly in keeping the land perfectly free from weeds and well tilled by the horse Planet Junior.

If a few very early tomatoes are required, you can now prune a few plants, pinching off the side shoots, topping when a few bunches of flowers have appeared, and tieing the plants up on stakes or trellis. But for the main crop staking or trellising should be avoided. Put round each plant a 6-inch layer of long straw, which has been previously trampled under the feet of horses in the yard or stable, and over this put another 6-inch layer of clean straw. In that way the plant, having its roots well fed and protected, will make rapid headway, will spread on the mulch in every direction, and yield abundantly for eight or ten weeks. At this time, which generally coincides with the beginning of the rainy season, prune them rather severely, leaving only four main branches. The cut-off branches can be used as cuttings for new plants. They come rapidly into bearing. The cuttings may be grafted into potatoes, as both plants belong to the same family, and two simultaneous crops—one of potatoes, the other of tomatoes—may be obtained.

Picking must be performed every day as soon as the plants are in full bearing. Never pour tomatoes from one vessel to another, as they are easily bruised. The fruit should not be packed when warm from the sun's rays. Let them get thoroughly cool in a draughty place. The best varieties to grow are the Mikado, Acme, Crimson Cushion. Never grow those sorts which have creases on their surface, as, besides not being so marketable, they are more liable to harbour pests than the smooth sorts.

The tomato is a hardy plant, requiring very little water for the production of perfect fruit, but on cold, badly drained soils it is—especially in wet seasons—subject to many fungoid diseases. The principal are:—The Leaf Blight, which rapidly destroys the whole plant; the Tomato Black Rot, which attacks the fruit before it is ripe, round the blossom end; and another fungoid disease, the Pimple Rot, which resembles the former disease, except that it attacks also the side of the fruit. One or two sprayings of Bordeaux mixture, given before the plant starts flowering, are said to be a good preventive. But

good drainage, thorough tillage, the removal and burning of every diseased fruit and plant, and also avoiding to grow tomatoes for two successive years on the same ground, are the best means of preventing the spread of these diseases.

The crop is ready four months after planting, and healthy plants yield an astonishing weight of fruit.

A WORD TO FARMERS' SONS.

THE SCARCITY OF YOUNG PLOUGHMEN IN BERKSHIRE.

There was a time when the farmers and ploughmen's sons in England were proud to be on the land, and took a pride in their well-tilled fields, their dairy cattle, pigs, and farm stock generally. There was also a time when the Queensland farmers' sons asked nothing better than to engage in farming pursuits. They would never have dreamed of exchanging the free and independent life, the healthy occupation, and hard work for the grinding toil at a city desk. But, to-day, what do we find? Country lads will no longer remain contented on the farm, but foolishly crowd into the towns and take "billets" at starvation wages in shops and offices, where they are tied down to hopeless drudgery for the rest of their lives. How many years would it take the shop assistant or the young civil servant to get a salary equal to one-fourth or one-tenth even of what a good dairy farm would yield him? It is not now, but in after years, that they will long to go back to the land. But then it will be too late. They have forgotten how to work with their hands, and possibly are too old to learn. Why will the young country lad not look round and see how infinitely better off he is in health, pocket, and freedom on a well-managed farm than the overworked shopman or civil servant or bank clerk, who are often compelled to work far into the night without any extra payment? Our advice to the young men is: "Stick to the farm, keep clear of towns and public-houses, and, given reasonable seasons and honest work, you can't go wrong." We talk of what we know from practical experience, and, although we sit in this editorial chair, we have never given up the farming business since we first set foot in the country. Now read what follows, and take it to heart:—

"At the Wokingham ploughing match recently held at Barkham, some interesting remarks were made by one of the judges bearing on the scarcity of young ploughmen amongst the agricultural labouring class. In responding to the toast given to the judges after dinner, Mr. James Morse, of Mapledurham, in South Oxfordshire, said that the work they had had to judge was creditable under the unfavourable conditions. The same degree of merit which applied to the men in their classes applied also to the solitary lad in the class for youths under twenty. It, however, appeared very strange that although forty-five competitors appeared in the four classes for men, yet only one competitor entered in the class where three good prizes were offered to lads under twenty years of age. This circumstance, the speaker said, seemed to indicate that there was still a growing inclination amongst the rising generation of agricultural labourers to shun the land, and go for the labour and sham attractions to be found in our towns and cities.. He did not hesitate in saying it was a great error and grave mistake, for, if only these young men would acquire a thorough knowledge of the different kinds of labour required to be done on a farm, they would never stand in want of employment, and would be better off than depending on the precarious chances of labour in urban districts. There was another point he must hold up as a warning. There was no poverty at the present moment in the rural districts of England compared with the poverty to be found in our towns and cities, where there was constantly going up a cry for work and none to be found. Doubtless a town life might have its fascinations, and be more attractive in a sense to many young men, but it militated against them in old age.

"Mr. Morse said, in conclusion, the growing repugnancy of spirit amongst the young labouring class to remain on the land was a great puzzle to him.

Different men had different opinions as to its causes; some put it down as the result of a modern education. He would not venture to decry education, nor would he enter into any deep discussion of a subject which seemed to tax the brains and talents of some of the most astute men in Parliament, but as an English farmer he had no hesitation in affirming what he had honestly learnt from observation. Education was undoubtedly given to the country with a good intention, but whether it was carried out under the best of methods was questionable. It seemed spoiled by political prejudices. One thing was clearly evident: Education in its ultimate results did not in this present age create amongst any class of Englishmen a love of hard work and the stern duty of getting one's living in life. On the contrary, it seemingly had the opposite effect. Every man nowadays wanted to become rich in forty-eight hours, not by dint of hard work, but through the medium of some accursed form of speculation. This same propensity, in the form of a false aspiration, oftentimes pervaded the minds of too many of the young men in the country districts. It was a thing very much to be deplored, for, if only these young fellows would try to learn the dictum of the immortal Carlyle, 'That there is always something noble in honest work,' they would discover that even to work on the land was far more honourable and even remunerative than the course which thousands took when they left the village for a town life, which oftentimes led them into an idle loafishness."

We have taken the above from the "Farmer and Stockbreeder," one of the foremost agricultural journals in Great Britain. If all this can be said about a farming life in England, with how much more reason can it be said of this glorious country of Queensland, with its fertile land, its splendid climate, its varied agricultural products, the cheapness of the necessaries of life, the easy means of communication, the nearness of the markets, the pleasant social life of the country? Think it over, young men, and be wise while there is yet time, whilst you have your health and strenuous young life. The land will keep you in comfort for the whole period of the seven ages of man. Will a Government billet do that for you?

THE MANAGEMENT OF SCHOOL GARDENS.

The following notes on School Gardens, by F. M. Marsh, Superintendent of Schools in Massachusetts, are well worth reading, especially by our teachers and members of the school committees in all parts of Queensland. One thing in particular should be borne in mind by the teacher whose school possesses a garden. No child should be ever punished for not doing certain work in the garden properly. Rather, if any punishment is demanded for neglect of other school duties, let that punishment be banishment from the garden for a period. As to managing the garden, the first essential is, in the absence of experienced gardeners as instructors, that the teacher be first taught. It will not take long to instruct an intelligent teacher, especially as all teachers, as a rule, are fond of beautifying the school surroundings by making flower gardens and planting trees. Before the gardening hour, the children should be assembled in the classroom with notebooks, and write down or copy from the blackboard simple clear instructions for the hour's work. Then they should go to the toolhouse, where they receive their tools, and then into the garden. Now Mr. Marsh discourses thus on children's gardens in "Transactions of the Massachusetts Horticultural Society" for 1905:—

After listening with you to the many interesting phases of the work with children's gardens which have been presented by the speakers this morning, I shall not attempt to add anything new, but I am constrained to ask you, for a moment, by way of review, to consider one or two points that may be open to discussion. First: Children's gardens should not be begun without careful plans and preparation on the part of the director. I am firmly convinced after

several years' experience that the garden movement, in its most sane aspects, is the best method of nature study that has yet appeared. It should not be taken up in a headlong manner as the result of a bit of temporary enthusiasm which has seized someone who has not counted the cost in labour, thought, and planning necessary to reach an ultimate goal which may be of sufficient worth to pay for the undertaking.

I have, now, in mind a city which of all cities in the State would be greatly improved by the children's garden idea; but in which a hastily conceived and poorly completed attempt at school gardening brought about failure, with the natural result that the whole idea has been sadly discounted and put in the background for many years. Do not injure the cause by starting with only surface knowledge and enthusiasm. Plan wisely and try to realise the highest aim of the movement.

This leads me to criticise some of the aims and purposes set forth in the papers this morning. Some of these aims and purposes have been devised to controvert the claims and criticism of the unthinking, who look upon the work as a "fad," which, to the public, is a horrible but indefinite something. I want to urge one and all not to allow children's gardening in any of its forms to be taken up in such a way as to be looked upon as a "fad." Make it a success, and the result will make the doubtful critic sorry that he had not deeper insight into the movement before he passed his hasty judgment.

It is not necessary to go very far afield to find an excuse for the garden idea for children. I fear that a tendency has been too often shown to make the movement too pedagogical; too cut and dried. Do not kill the enthusiasm of the young gardener by making him feel that his garden work is for the sake of helping his arithmetic, his language, or his nature study. It is well to correlate, but do it indirectly, or it will, I fear, react unfavourably if we continually try to defend the school garden by illustrating how it may be used for the sake of numbers, language, science, &c. If the idea of children's gardens has not sufficient merit and value to stand upon its own feet, it had better fall before it climbs any higher.

I like to put the matter the other way, and this, perhaps, is what our friends mean—*i.e.*, to correlate the subjects of science, language, and numbers with *gardening* in such a way that these subjects may serve as aids to gardening, and be used as means or instruments for the sake of the more real thing, the garden. It is not necessary to apologise for the children's garden by showing how the idea may be correlated with all the rest of the curriculum. As I have before said, I fear that any such cut-and-dried treatment may take away the very naturalness and life of the movement and put out of sight the real kernel and highest purpose of the garden idea.

Another claim is often made that through the gardening a business instinct is developed. Examples of bright boys selling products, cornering the market, getting control of the other boys' crops, &c., are set forth as results. It is not denied that thrift may be developed, but it is not necessary to use the school or home garden to teach the bright Yankee boy how to do a commercial trick. There is enough of this spirit in the air to make it sufficiently contagious.

The real aim, it seems to me, is to create a love for the beautiful plant and shrub, and to show the boy how to make a small plot of earth or yard serve as an economic aid to the home, not only in supplying vegetables but also flowers and beautiful surroundings. Children's gardens are not for the sake of the school or the subjects in the curriculum, but for the more important institution, the home, and for the sake of the children themselves. We aim to develop patriotic citizens, but if a man loves his home it is not difficult to arouse his patriot spirit in time of war. It is a higher type of patriotism which makes a boy love his home enough to have a desire to make it beautiful and wholesome within and without. Teach a boy or girl how to make a back yard beautiful and fruitful, how to make and keep a fresh and even lawn with its

boundary or shrubbery, and you will have aroused a new interest in the home and with it a corresponding love therefor.

A community made up of such individuals and such homes will be wholesome and beautiful. The character of any place depends so much upon its homes that any movement that tends toward their improvement will be worth the cost.

My word of warning, then, is to be certain that children's gardens are never introduced until sufficient preparation is made to assure permanent success. Do not make the idea too pedagogical, thus diverting attention and interest from the real and living aim which it seems to me is to interest the child in the possibilities and beauties of Nature through a knowledge of vegetable and plant life; and, finally, utilising this interest in beautifying the home and its surroundings.

These experiences will not only react upon the character of the town, but also upon the life and character of the individual boy and girl.

A RETROSPECT.

The long drought which operated so disastrously all over the State, but more particularly for five or six years in the Far West, came to an end in the beginning of 1903. On the 30th of March of that year rain set in at Thargomindah, 750 miles west of Brisbane, and heavy rain fell at Charleville on the same date. At this time the state of the country was pitiable. Not only was there no grass, but even thousands of trees, especially cypress pine, were killed. The great flocks of sheep and herds of cattle were reduced by more than 50 per cent., and in some districts were wiped out altogether. Fears were expressed that the grass would never grow again, as it was believed that both roots and seeds from which a recrudescence might be expected were utterly destroyed.

But when the rains came in earnest the marvellous recuperative powers of the soil were quickly in evidence. As if by magic, the whole face of the drought-stricken country was changed. Not only did the grand old Mitchell grass cover the Western lands as of yore, but many new varieties of excellent fodder grasses sprang up. Barely four years have elapsed since that disastrous time, but those four years have been years of plenty. The cattle and sheep have increased to an incredible extent, and the pastoral and agricultural industries have never been more flourishing. The wheat crop of 1904 amounted to over 2,000,000 bushels, and it may safely be stated that, when we have the population required to handle our lands and crops in the manner in which they should be dealt with, Queensland will surpass in her productions all the States of the Commonwealth. In the matter of wheat alone the average production for the past twenty years, including the drought years up to 1902 and the dry year of 1905, is 14·66 bushels per acre, and this surpasses the average of the United States, India, Russia, and the Argentine. The average yields for the year 1904-5 in Australasia, exclusive of New Zealand, were, according to the Official Year Book of New South Wales—

South Australia	6·6	bushels	per acre
Queensland	14·24	,,	,,
New South Wales	9·3	,,	,,
Victoria	9·2	,,	,,
West Australia	11·1	,,	,,
Tasmania	18·4	,,	,,

Now, let us turn to the sugar industry, as recorded since the drought. In 1898 the record crop of sugar was harvested. From 1,542,090 tons of cane secured from 82,391 acres, 163,734 tons of sugar were made. In 1905, 96,093 acres of cane were crushed for a yield of 152,722 tons of sugar, 94 per cent. net titre. How nearly we are approaching the output which will necessitate export, and, consequently, severe competition with countries in which

sugar is grown by cheap labour, is clearly shown by a comparison between the present output and the requirements of the Commonwealth, the output being, as above stated, about 153,000 tons, and the total consumption 183,794 tons, which, if we include New Zealand's wants, rises to 224,187 tons. A subject for congratulation is the rapid expansion of the dairying industry. Let us again take the last year of the drought. Our export of butter in 1902 amounted to only about one-fourth of that for 1901. We sent away but 552,625 lb. of butter, valued at £24,610. The year 1903 saw these figures exactly doubled. In 1904 the increase of the butter export was phenomenal, as it amounted to 9,520,921 lb., of a value of £344,943. In the following year, 1905, beyond which we have as yet no official returns, the export reached 11,773,182 lb., worth £455,863, and it may safely be asserted that the returns for 1906 will far exceed these figures. Nor can we wonder at this expansion. The seasons have been most propitious. Grass and water abound over the whole State. The farmers have, in addition, laid down large areas of paspalum grass, and many have planted Rhodes grass. They have also in several cases erected silos, and have thus saved many thousands of tons of silage as a provision against the inevitable scarcity of some future year. Would that we could congratulate *all* dairy farmers on their foresight in this respect. Many dairymen are receiving cheques for £70 and £80 monthly for their milk and cream, and female cattle of Jersey, Ayrshire, or Shorthorn breed are almost unobtainable, so unwilling are their owners to part with such valuable money-making machines.

The industry has been greatly assisted by advances made in aid of butter factories, under the provisions of the Meat and Dairy Encouragement Act, to the extent of £12,367, of which sum £6,488 has been repaid, the capital indebtedness to the State at the end of 1905 being only £5,879, which is satisfactory evidence of the prosperity of the industry. Loans have also been made to nineteen creameries of £1,910, and of these all but three have paid off their indebtedness. Cheese factories have been aided in like manner to the extent of £1,525, and in all cases but one the loans have been repaid with interest.

We have said enough on the subject of the dairying industry to show on what solid ground it stands. Taking a general view of the farming industry, it is noteworthy that there are 16,914 persons engaged in general farming operations on their own account, cultivating between them 622,987 acres, or an average of 36·8 acres each.

We should have expected that irrigation in farming districts would have been largely extended in view of the losses sustained on unirrigated farms and the good yields of various kinds of produce on those where irrigation is systematically carried out, but, so far, there are only 13,693 acres regularly irrigated, and 77 per cent. of such irrigated areas is in the sugar districts of Bundaberg and the Lower Burdekin.

Tobacco-growing has increased by 149 acres, there being 933 acres under this crop as against 784 acres in 1904. The average production per acre has also increased from 9·09 cwt. to 10·96 cwt. The total production for the year 1905 reached 3,105 cwt.

The banana trade, which suffered so severely from the destruction of the groves in the North a couple of years ago, has wonderfully recovered, nearly double the number of bunches being produced in 1905 than in the previous year, and we expect that the 2,509,268 bunches exported in the former year will show a considerable increase when the returns for 1906 are available. Each steamer from the North brings now from 20,000 to 30,000 bunches per bi-weekly trip. The fruit industry generally is rapidly expanding.

Taking the returns from all our industries as set forth in the annual report of the Department of Agriculture and Stock for the year 1905-1906, we see great cause for congratulation, and a great incentive to a stimulation of immigration from Great Britain and other European countries.

The Atherton District.

By ALBERT H. BENSON, M.R.A.C.

Right inside the tropics, a short distance to the south of the seventeenth degree of south latitude, 68 miles by rail south-west of Cairns, and at an very pleasant one, particularly during the winter months, and that by rail point of the finest tract of scrub land in Australia. Atherton is reached by taking a steamer to Cairns and thence by rail. The steamship journey is a very pleasant one, particularly during the winter months, and that by rail passes through what is undoubtedly the finest scenery in the Commonwealth. Leaving the humid seaboard at Cairns, with its wealth of tropical vegetation, its cocoanut palms, its bananas, and its sugar-cane, the gorge of the Barron River is slowly climbed, the Barron Falls are passed, and, at a distance of 21 miles and an elevation of 1,080 feet, Kuranda, with its coffee plantations, beautiful scrub and river scenery, and even climate, is reached. From Kuranda the line goes up the valley of the Barron for some miles, passing through a richly timbered country, mostly scrub, that will give good grass and will eventually become good dairy country. After leaving these scrub lands, a belt of poor country is passed through till, at 46 miles from Cairns, Mareeba, 1,325 feet, is reached. The country here is open forest of medium quality, which gradually improves in value as one proceeds towards Atherton, the bulk of it being a red loam of medium texture, fair depth, and volcanic origin, that, were it in one of our wheat belts, should grow this crop to perfection, and which, were it systematically cultivated in order to retain moisture during dry spells, should become a valuable asset to the district.

The scrub proper begins at Tolga, 64 miles from Cairns, and from there to Atherton the line runs through some very rich country on the northern edge of the scrub. Of the extent of the scrub I can form no accurate idea, but I have seen enough of it to warrant my stating that it contains enough good land to support some thousands of families once it is brought under a system of intense cultivation.

I have had the opportunity of visiting this country several times during the past nine years, my most recent visit being in July last, when I was accompanied by Mr. H. W. Mobsby, the artist of this Department, who secured a number of views of the district, some of which accompany this report. On several previous occasions I have reported on this district, and have expressed my views on its capabilities to the Press of both Cairns and Townsville.

As many of the readers of the "Agricultural Journal" may not have had an opportunity of reading these reports or Press notices, and there is a general desire to obtain reliable information respecting this part of Queensland, I will endeavour to show what the Atherton country is like, what crops it grows and is capable of growing, and what market there is for these crops when grown; in brief, I will give my opinion of this really fine country, that I firmly believe is destined some day, and at no very distant date, to be one of the most prosperous parts of the State.

My remarks refer not only to the scrub lands immediately to the north, east, and south of the town of Atherton, but to those large areas of tableland scrub that lie to the west of the Lamb and Main Ranges, that divide the upper waters of the Herbert and Barron from those of the Mulgrave, Russell, Johnstone, and Tully Rivers, and extend west in the direction of the Herbert River. The northern portion, or what may be termed the Atherton Scrub proper, drains into the Barron River, and the southern part, or Evelyn country, drains into the Herbert River, and is watered by the Millstream Creek and its branches, North Cedar and South Cedar Creeks.

The Atherton Scrub proper, as already stated, is drained by the Barron River and its tributaries—permanent streams of excellent water; and, in addition to this, good water can be obtained throughout the scrub at a depth of from 60 to 100 feet.

The town of Atherton, the present terminus of the railway, is on red forest soil on the western edge of the scrub, on a tributary of Mazzlin's Creek, which is again a tributary of the Barron River, and the scrub land extends to the north as far as Tolga, to the east as far as the Barron and thence to the Lamb Range, and to the south as far as the head waters of the Barron and its tributary creeks on the Main Range that divides the waters of the Barron and Herbert. This is a large belt of scrub land of which not less than 50,000 acres is practically level; and of the balance many thousands of acres can be put under cultivation, and the rest, though broken, can be laid down to pasture, and will make the best of dairy country.

The soil, though it varies a little in parts, is, on the whole, of remarkably even quality. It is of a dark-red or reddish chocolate colour, and of extraordinary depth. The surface soil, owing to the presence of vegetable matter, is darker than the subsoil, but once the subsoil is reached there is no appreciable difference in its character or texture for the next 40, 60, or even 100 feet, as shown by wells that have been sunk. The land in its virgin state is covered with a heavy growth of scrub, in which are many fine timbers, such as cedar, beech, silky oaks of different kinds, bean, crowfoot, elm, and many others, usually straight, clean, and well-grown trees, without the dense undergrowth of vines met with in purely coastal scrubs, but with considerable scrubby growths of many kinds. When cleared, the surface soil is a rich loam of medium texture, easily worked when taken at the right stage, retaining moisture well when well cultivated; and the subsoil, though somewhat firmer and heavier than the surface soil, is still friable, possesses good natural drainage, and, owing to its great depth, has a practically inexhaustible supply of most plant foods. The cost of clearing the land is not excessive if gone about the right way—viz., to fall the scrub on a face in such a way that the trunks of the trees will all lie in one direction, lop it so as to get a better fire, and then let it lie till thoroughly dry, so as to get a good burn off. Falling will cost from 30s. to 35s. per acre on an average, and lopping from 5s. to 7s. 6d. an acre extra. The latter is money well spent, as it insures a much better burn off.

Given a good burn off, a crop of corn can be put in with the hoe at once, and will produce an excellent return; but, should the burn off be a poor one, it will be necessary to stack up and burn off the heaviest of the timber before planting.

The bulk of the stumps will rot out in five years, and those that do not do so, such as beech and bean, can be then grubbed out, and the land put under plough. This is the cheapest method of clearing the land, and that usually adopted, but where the land is to be laid down to grass, given a good burn off, the grass seed can be sown as soon as the ashes are cold, the unburnt timber being stacked and burnt off as time permits.

Corn does remarkably well, crops of 2 tons to the acre—80 bushels—being by no means uncommon. Only one crop a year, as a rule, is grown, the seed being planted at the beginning of the wet season in January, and the bulk of it is put in and cultivated by the hoe. It is harvested during May and June, and, should the autumn be dry, there is little trouble in the matter. Usually, however, the autumn is not dry, for, though the rainfall may be light, there are heavy mists, which prevent the hardening up of the grain. So far, the bulk of the corn cultivation is in the hands of Chinese, the harvesting methods in vogue are very crude, and there is considerable trouble in getting the corn dry enough for shelling and tanking. This is a matter that can, however, be easily overcome by kiln-drying the cob corn, when it can be easily husked and shelled by up-to-date machinery and tanked in perfect order. The bulk

of the corn grown is of a soft nature, and unless thoroughly dried it is apt to mould when tanked, and thus to be of inferior feeding value.

The type of corn grown is by no means first class, for, though the cob corn is of large size and usually well filled, the grains are short and the cobs are very large. This also can be overcome by a careful selection of the seed corn and the breeding of a better type of corn in the district. As a judge at the last Atherton show, I had a good opportunity of examining the corn of the district, and, although at first sight the cob corn exhibited was a magnificent lot, yet, when carefully examined, it was very disappointing, the cob in every instance being too large and the grain short and soft. The corn grows a big stalk and heavy leaf, so that for ensilage-making or soiling to dairy cattle it would be hard to beat. Some 5,000 tons of corn have been grown in this district in a single season, and for hard well-dried samples there is a ready sale, both on the coast and in the mining districts to the west and north. Wheat and oats for hay do fairly well, and all kinds of sorghums produce heavy yields.

Pumpkins crop heavily, both cattle and table varieties, as also do potatoes, both sweet and English.

Lucerne does fairly well—better, in fact, than I have seen it on other red scrub lands throughout the State—and will prove a valuable crop for the district.

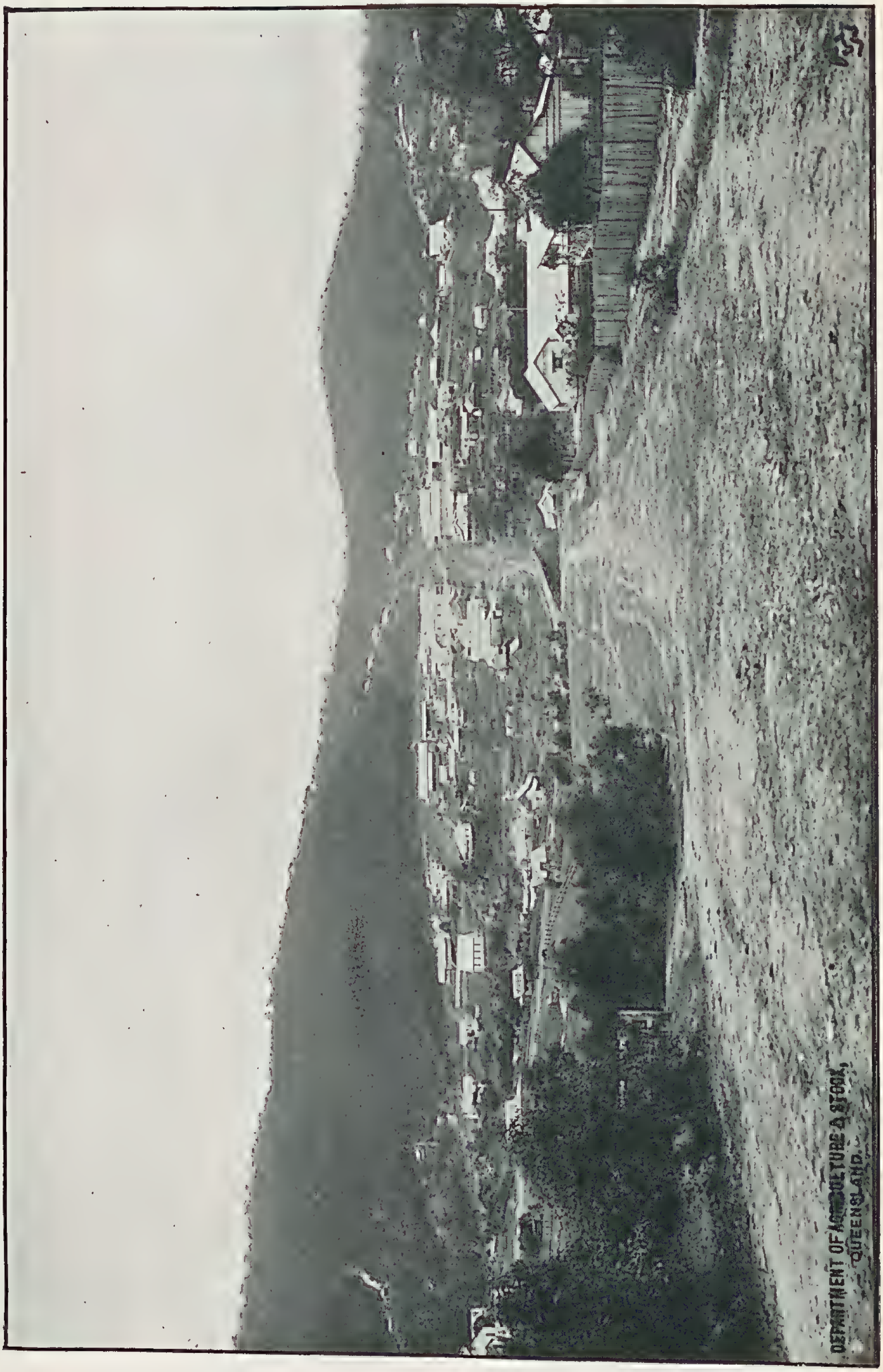
The natural grasses and herbage of the district, like those of all rich scrub lands, are of very poor quality, but cultivated grasses where planted promise to be an unqualified success. *Paspalum dilatatum* does especially well, as also do Prairie, Guinea grass, Giant Couch, and the different kinds of millets and panicums. Rhodes grass, clovers of sorts, also promise well, and I have no doubt that in time pastures containing a good mixture of grasses and clovers will become general throughout the district, and prove of high value for grazing and dairying. Mangolds and cassara also do well, and will provide an excellent standby for any possible dry spells, and particularly for spring feed.

In brief, the district can grow to perfection a very wide range of fodder plants, so that there is no reason why any farmers should not at all times and seasons have an ample supply of food of one kind or another for his stock, and should never suffer during a possible dry spell.

All kinds of vegetables do well, but the culture of fruit should, in my opinion, be confined to the planting of few varieties, and then only for purely local consumption.

The district is just outside the range of purely tropical fruit, for, though the papaw, pineapple, mango, and banana are to be seen growing in many places, they are by no means first class, and do not compare at all favourably with these same varieties when grown under more suitable conditions on the coast. Oranges, mandarins, and lemons do fairly well, also many fruits of Chinese origin, but the fruits of the temperate regions are not a success. Strawberries, Cape gooseberries, and tomatoes will probably do very well, but the market for same will be purely local. Sugar-cane, though grown to a small extent, is not a success, though coffee does well when thoroughly sheltered. Arrowroot grows well. From what I have written it will be seen that there is a wide field open to the farmer and a choice of many crops, and I am of opinion that for many years to come there will be a good market for all the district can produce in the North. The great development that mining is making in Northern Queensland and the consequent increase in population provide a good market for vegetables of all kinds, poultry, butter, bacon, &c., as well as for the fodder required for the teams that are employed in the cartage of ore, coke, stone, etc., for the mines. Railway communication enables such produce to be sent to many markets, and as same is extended new markets will be opened up. In my opinion, the climate and country are ideal for dairying and its attendant industries of hog and poultry raising, as there is a good rainfall, moderately cool summers, with cool nights and mild winters,

Plate I.

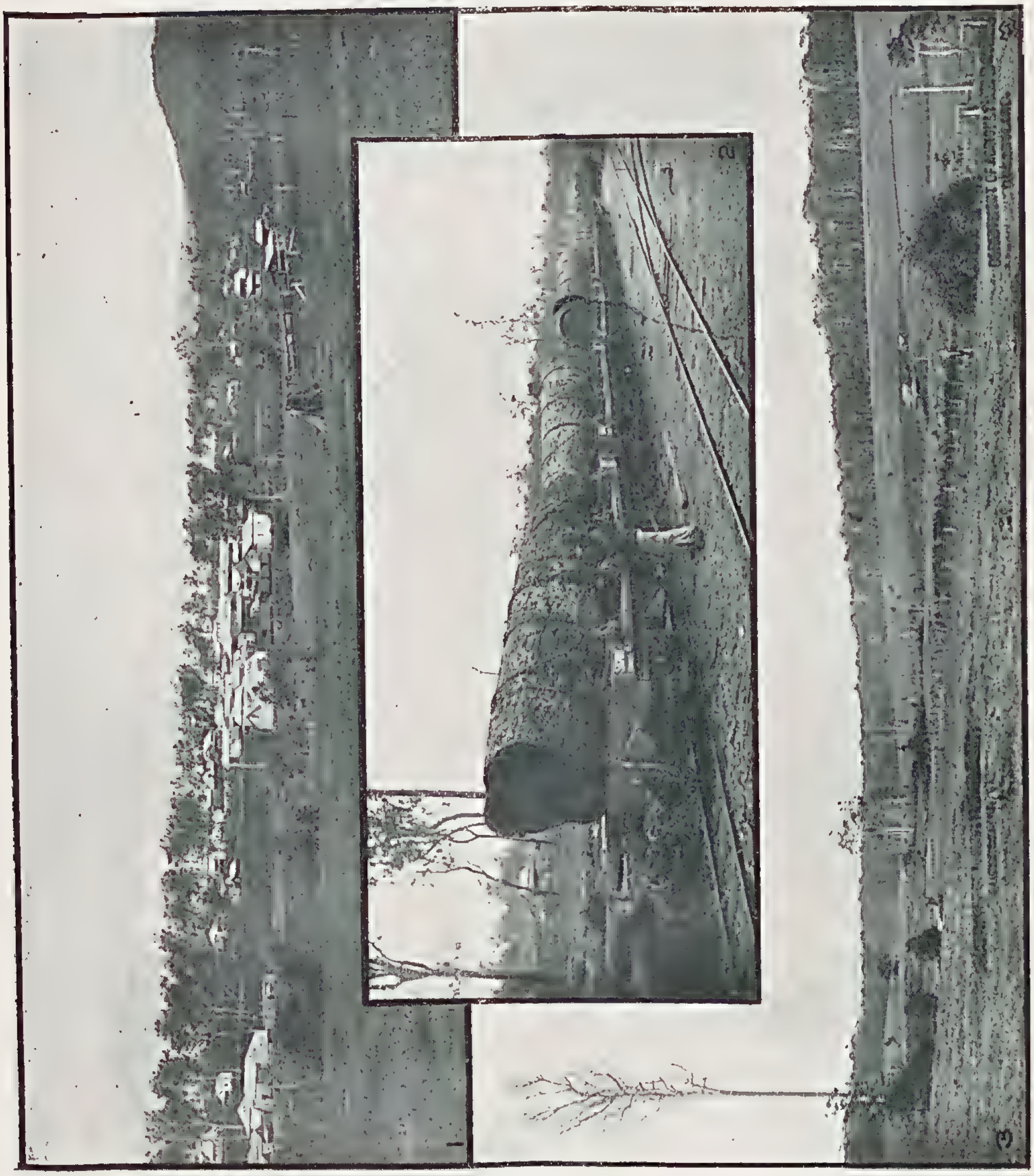


Herberton, North Queensland.

Plate II.

1. Mr. Mazzlin's Homestead, Gorge Creek.
2. Mr. Mazzlin's Wheat Field, Gorge Creek.
3. View in the Evelyn Scrub.
4. Maize Field, Gorge Creek.

Plate III.



1. Atherton, North Queensland.
2. Cedar Logs on Railway Trucks, Atherton.
3. Farm near Atherton.

frost, though by no means unknown, being slight, as shown by the fact that many tropical fruits and plants are not seriously injured thereby.

Going south from Atherton, crossing the Main Dividing Range, one comes to Herberton, 12 miles, situated at an elevation of about 1,000 feet above Atherton. After leaving Atherton, the road skirts the edge of the scrub at first, and then starts to climb the main range gradually, the township of Carrington being passed *en route*. The character of the country changes, and from bassalt one gets on to granite. Several small creeks are crossed before the main climb up of the range is reached. The climb is a fairly stiff one, though there is a fair road. From the crown of the range the road descends gradually to Herberton, the country passed through being all granite, and greatly resembling that met with in some parts of the Stanthorpe district—similar trees, plants, shrubs, and soil being seen.

The town of Herberton is in granite country, the granite extending north and west, but soon cutting out to the south. The climate is one of the best in the State—cool summers and comparatively mild winters, with an average rainfall of some 44 inches. There is very little agricultural land close to the town, the country being wild and broken; still, at some 3 miles to the south, at Nigger Creek, fair country is met with, and continues in a southerly direction till the Bluff is reached. On Nigger Creek and its branches there are some small alluvial flats that grow good vegetables, corn, and other farm crops; but the bulk of the land between Herberton and the Bluff is rolling red forest of basaltic origin, carrying large bloodwood, gum, and ironbark trees. When cleared, this land grows good crops of corn, potatoes, oats, wheat, &c., as well as vegetables and fruit. Grapes should do well, provided that suitable varieties are planted; and apples, plums, peaches, and other temperate fruits can be grown; but it is doubtful whether their culture will ever prove profitable for other than a purely local market. Citrus trees bear well when grown in suitable soil and in suitable locations, and given the necessary care in their culture they should easily produce enough for local requirements. The red soil forest in its unimproved state only grows a poor pasture—blady and kangaroo grasses predominating. Yet, were it looked after and laid down to good grasses, such as Rhodes grass and *Paspalum dilatatum*, I have no doubt that it would make good fattening or dairy country.

Continuing south and crossing a narrow belt of very poor country at the Bluff, the Evelyn lands are met with. At first they are only fair forest, but on the upper waters of the Gorge Creek, as the scrub is approached, they become very rich, and are covered with heavy forest timber of good quality. Mr. Mazzlin, who is the pioneer farmer of this part, has a fine property, partly forest and partly scrub; the forest land, which has been under cultivation for some years, bearing heavy crops of corn, oats, wheat, potatoes, and vegetables of all kinds. Three tons of hay to the acre is by no means an uncommon crop, and at the time of my visit in July I estimated that a crop of wheat of some 40 acres in extent, then planted some ten weeks, would yield at least this amount. Mr. Mobsby obtained a photograph of this wheat field, which is reproduced herewith, and will show clearer than any words of mine what the soil can produce. The winter was a very open one, and beans, peas, pumpkins, and marrows adjacent to the wheat were in full growth; in fact, the vegetables were as fine a lot as could be found in the State, and were worthy of a prize at any show.

Mr. Mazzlin has done a lot of experiment work in the growing of different crops, fruit trees, &c., on both the forest and scrub lands; and an experiment now being carried out by him with different grasses, clovers, and fodder plants in the latter is of extreme value, as it shows conclusively the wonderful capabilities of this land for producing fodder plants. I was so much impressed with the value of the soil for this purpose that I think I cannot do better than

mention the various clovers and grasses that I saw growing together, with a few remarks on their growth.

The land is a deep chocolate loam of great richness, fairly level, from which the timber had been burnt off some months previously. It was then planted to corn, and the experiments have been carried out between the rows of corn. Of clovers, I noted the following:—

Perennial Red Clover or Cow Grass (*Trifolium pratense perenne*).—This clover was in flower and seed, the seed maturing thoroughly, and the matured seed of this plant grown here has been found to germinate well, a very important consideration, as it ensures the permanence of this valuable plant. It had made a growth of 3 feet or even more, and was remarkably strong and healthy.

White or Dutch Clover (*Trifolium repens*).—This well-known fodder plant had grown into a dense mass, a foot or more in height, the growth being unusually vigorous. It seeds freely.

Alsike or Hybrid Clover (*Trifolium hybridum*) was also doing well, and when grown from acclimatised seed will undoubtedly improve.

Trefoil or Burr Clover (*Medicago denticulata*).—Making a strong growth.

Lucerne or Alfalfa (*Medicago sativa*).—Doing well for scrub land, good leaf and growth.

Of introduced grasses, I noted the following doing well:—

Golden Crown Grass (*Paspalum dilatatum*).—Stooling rapidly, making a strong leafy growth, and seeding well.

Russell River Grass (*Paspalum Galmarra*).—Doing fairly well, but not quite equal in luxuriance to that grown on alluvial flats near the coast.

Rhodes Grass (*Chloris virgata*).—There were only a few plants, but these showed great promise, and I am of opinion that it will turn out to be one of the best grasses for this scrub country.

Giant Couch (*Panicum spectabulum*).—Doing better than I would have expected, as it is a grass that does best under more tropical conditions. It is worth further testing on account of its high feed value.

Guinea Grass (*Panicum maximum*).—This grass grows too strong, if anything, and will be more valuable for soiling than for pasture, as, if it becomes over-ripe, it is so coarse that stock do not care for it.

Prairie Grass (*Bromus unioloides*).—The valuable fodder grass that does so well on the Downs, Lockyer, South Coast, and North Coast districts does equally well here, and should always form a portion of any pastures that may be laid down.

Ril Grass (*Plantago lanceolata*).—This fodder plant, which is always present in the finest English pastures, is producing an enormous quantity of herbage; in fact, I have never seen a stronger growth of this plant.

The clovers and grasses are all of high feed value, and to me it was certainly an eye-opener to find them all doing so well at any one place, as the plants I have mentioned are of widely different origin. This goes to show the remarkable quality of the soil and the suitability of the climate for the production of a pasture of the very highest feed value, as a pasture compound of a mixture of the clover and grasses I have mentioned will produce an ideal and perfectly balanced ration for both dairying and fattening.

The land on which the experiment is being carried out is on the northern end of the Evelyn Scrub, and is similar in character to many thousands of acres of virgin country to the south and east. The Evelyn Scrub differs somewhat from that of Atherton, and is, if anything, even richer, as it contains more

humus, as is shown by the darker colour of the surface soil. The soil is of great depth, and the timber of the scrub is even of larger size and more varied than that of Atherton. There is a continuous belt of scrub from here, in an easterly direction, right to Geraldton, some 57 miles, much of it very broken, but all capable of being converted into first-quality pasture. This country is well watered on both sides of the main range, and on the eastern side of the range it is of a purely tropical character. To the south, the rich scrub lands extend to the Millstream Creek and its branches, North Cedar and South Cedar Creeks, and considerably beyond; but to what extent or how far I am not personally acquainted, though, from numerous reports that I have received, there is a very large area of rich land of which very little is known, as it is difficult of access, parts are very broken, but all is well watered. Though not personally conversant with the whole of the country, I, as stated earlier in this article, have seen enough to warrant my saying that it is undoubtedly the largest tract of really first-class scrub land in Australia, and that once it is opened up by means of railways it is capable of supporting some thousands of families. The climate is good; rainfall, good; soil, the best; water, good and plentiful. The country will grow heavy crops of corn, potatoes, hay, &c.; and, judging from the clovers and grasses I have seen it growing, it will carry a pasture that will be hard to beat in any part of the world, either for fattening or dairy purposes. There is a good local market for all produce, and, with the extension of the mining industry and of railways to the different mining centres, this market will be greatly increased in the near future, and there will be an increased demand for all kinds of farm and dairy produce, fruit, vegetables, &c. The timber industry will also become a much more valuable one than it is at present, as the wood of many of the scrub trees is of great beauty, and once it is known is bound to become of value to furniture-makers and others. As an instance, take the Northern Silky Oak. Only a few years ago it was practically unknown outside the districts in which it is grown, and now we find it being used in the making of our railway cars and for cabinet-work and joinery of all kinds; and there are many timbers now practically unknown that are equally valuable for these purposes. In conclusion, I feel sure that this country is, as I stated in the beginning of this article, destined ere long to become one of the most prosperous parts of the State, as there is every prospect of an intelligent farmer or dairyman making a success of agriculture or dairying, provided that he is not too greedy and takes up more land than he can handle, but devotes his energy to the development of such an area that he can work it to the best advantage, as I am of opinion that a small area well worked in this rich country will pay very much better than a much larger area indifferently handled.

TO CALCULATE THE HEIGHT OF A TREE.

The exact height of any tree may be ascertained by the help of a stick, the sun, and a simple sum in proportion. Take a stick of any length from 6 inches to, say, 2 feet. Plant it in the ground so that the portion above ground represents an exact number of inches. Now, note if the tree is upright or leaning. If the latter, incline the stick at as nearly the same angle as possible at which the tree inclines. Then measure the shadow of the stick and also the shadow of the tree. The proportionate lengths of the shadows of the tree and stick, and of the stick itself, will give the height of the tree.

Example:—The height of the stick from the ground is 6 inches. It throws a shadow of 8 inches. The shadow thrown by the tree is 40 feet. The question then is:—If a stick 6 inches in length throws a shadow of 8 inches, how high should a tree be to throw a shadow of 480 inches? As 8 : 480 : 6 : : 360, or 30 feet, which is the height of the tree.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 30TH NOVEMBER, 1906.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Dot ...	Shorthorn ...	18 Aug. 1906	690	4·9	37·86	
May ...	,, ...	31 Oct. ,,	852	3·6	34·35	
Rosebud ...	Ayrshire ...	3 Sept. ,,	743	4·1	34·11	
Bliss ...	Jersey	3 May ,,	534	5·2	31·10	
Honeycomb	Shorthorn ...	19 July ,,	588	4·6	30·29	
Careless ...	Jersey	2 Nov. ,,	570	4·7	30·00	Milk recorded from the 9th Nov., 1906, when considered fit for dairy purposes.
Dora ...	Shorthorn ...	29 May ,,	630	4·2	29·63	
Lass ...	Ayrshire	15 Mar. ,,	545	4·6	28·07	
Winnie ...	Shorthorn ...	11 Sept. ,,	779	3·1	27·04	
Belle ...	Jersey	4 Oct. ,,	641	3·7	26·56	
Lady ...	Ayrshire	12 Oct. ,,	564	4·1	25·89	First calf
Butter ...	Shorthorn ...	11 Aug. ,,	642	3·6	25·88	
Restive ...	,, ...	3 Aug. ,,	554	4·1	25·43	
Hettie ...	Ayrshire Sh rth'rn	28 Jan. ,,	402	5·6	25·21	
Rosalie ...	Ayrshire	5 July ,,	564	3·9	24·63	
Noreen ...	Holstein Sh'rt'hn	3 Oct. ,,	698	3·1	24·24	First calf
Princess ...	Shorthorn ...	28 July ,,	541	4·0	24·23	
Friz ...	,, ...	30 Oct. ,,	633	3·4	24·10	Milk recorded from the 6th Nov., 1906
Nellie II. ...	,, ...	29 July ,,	509	4·2	23·94	
Esther ...	Holstein Sh'rth'rn	17 Oct. ,,	566	3·7	23·45	First calf

MAKING SMALL CHEESE AT HOME.

It is not always easy, it is not always possible in some cases, to buy good cheese for home consumption; and it is always expensive. Cheese, however, is one of the most wholesome, nourishing, and generally acceptable foods we can have, but the difficulty of obtaining it, or of making it at home, prevents its more general use in many cases. It will probably be difficult, if not impossible, for anyone who has no experience to be successful in making cheese at first, but for one who has had a little practice, or is willing to try a few times in order to learn, the directions given by a writer in the "Indiana Farmer" will be valuable. The appliances one has at hand will serve probably, except that something in the way of cheese hoops and a press must either be purchased or devised from materials at hand. A small-sized press would not be very expensive, however, and would probably be worth while for anyone who wished to make a supply of cheese each season for home consumption.

The writer says:—

"Here is a well-tried plan of making small cheese at home. We will assume that we use 500 lb. of milk, testing 4 per cent. fat. If the quantity of milk be more or less, the amount of rennet, salt, &c., should be proportionate. The night's milk should be well aired, cooled, and kept at a temperature of 65 degrees Fahr. Take the fresh morning's milking, and mix the night's milk with it in a vat or tub, about 20 inches deep. A very simple and effective way of heating the milk is by using two small cans, 7 inches in diameter, and high

Plate IV.

Dairy Cattle in Rosenthal Creek, Warwick.

enough to extend above the surface of the milk. Fill these cans with hot water, and move them around in the vat until the milk is warmed to 84 degrees.

"Put 1½ oz. of rennet extract into ½-pint of cold water, and add to the milk, stirring for 2 minutes. The mass will coagulate and be ready to cut in about 25 minutes. The curd is ready to cut when it will break clean over the finger. Cut with a cheese knife. Keep the mass stirred, so that the small cubes will remain separate. The heating-cans can be used again in 10 minutes. Keep them moving around in the vat, and also move the curd well, in order to prevent any portion of the latter from becoming overheated. When the thermometer registers 98 degrees Fahr., take out the cans and stir the mass until the curds do not readily adhere; then stir occasionally until ready for the mould.

"To determine whether it is ready or not, take a handful of curd and squeeze it hard. If it has an elastic feeling, showing it to be well dried out, then drain off the whey. Keep the curd well stirred until it is cool and free from moisture; this will require about half an hour. Add 1 lb. of salt, thoroughly mix with the curd, and wait 15 minutes before pressing. If small, 12-lb. cheese are wanted, get four 7-inch hoops, 12 inches deep.

"Take a cheese bandage to fit the hoop, and long enough to project 1 or 2 inches at each end. Place a round piece of cotton cloth at the bottom of the hoop as a temporary cap; then put in the bandage with the lower edge turned in about 1 inch on top of the bottom cap and upper edge turned back over the top of the hoop. Fill in the curd, fold in the upper edge of the bandage, put on as a top cover a piece of cotton cloth similar to the one on the bottom, and place in press. For pressing, use a ½-inch screw set in a frame, and provided with means for turning. After an hour, take out of the press, adjust and smooth the bandage, covering the edges nicely, and put on cap cloths of same material as the bandage, with cotton press-cloths on the outside of these. Put the cheese back into the hoop with a strong, round wooden 'follower,' and press again until the following day. Then take out the cheese, remove the press-cloths, but not the bandage and caps, and place it for curing on a shelf in a room having an even temperature of about 60 degrees Fahr. It should be cured in 3 or 4 weeks."—Nor' West Farmer."

COLD DAIRY WITHOUT ICE.

Last month we found, in two of our exchanges, an item on this subject, merely credited to exchange. We have no doubt that the plan can be made to work if carefully watched. A manufacturing company in Texas is making a cooler on this plan, but portable. It is patented, built of galvanised iron and wood. Two metal pans, one at top and one at bottom, with shelves at the sides and curtains all round. The pans are kept filled with water, and the curtains rest in the water, both at top and bottom, which keeps them wet, and the evaporation cools the air. If the idea of the item below does not infringe upon this patent, we believe that it would be a good one.

An ingenious woman I know has devised a plan for having good, cold milk and butter all summer without ice. It is a home-made dairy, is so cheap, easily taken care of, and is successful. I will give the plan, and any housewife can have one with very little work.

Get four pieces of scantling, 2 by 4 inches, 6 feet long, and nail pieces 2 feet long each way about 2½ feet from the ground, and nail pieces of the same at the top. Then board over top, and also lay a floor at bottom. Now, put a shelf on each side and cover all around and on top with nice clean bran sacks or burlap. Leave one side open, and put loops on it, and rails on the side to fasten it.

Put a tub on top, and fill it with water, and put woollen strips of cloth, 2 and 3 inches wide, in it, so that they feed the water down and keep the sacking

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wet all the time. The air blowing through the wet sacks keeps everything almost as cool as if it were in a refrigerator, and the butter and milk taste better than if it were shut from the air, and will keep fresh much longer in this dairy. An old blanket makes the best feeding strips; put in enough to have three or four to each side.

This dairy was kept in the yard, under a shade tree, but the back porch is equally as good a place, and more convenient. Anyone who tries this plan I am sure will be delighted with it.—"Florida Agriculturist."

IMPROVED SHEEP-BREEDING IN AUSTRALIA.

A correspondent of the "Manchester Guardian" writes:—"The effect of improved sheep-breeding in Australia on its wool exports is almost incredible. This year about 75,000,000 grown sheep have been or will be shorn—less by 30,000,000 than there were twelve or fourteen years ago, before the drought. Then the exports reached within a few thousands of 1,600,000 bales, but during the drought the number of bales gradually declined until the exports from the Commonwealth fell to just under 1,000,000 bales. Notwithstanding, however, the great reduction in the number of grown sheep, the total exports for the present wool year will probably reach 1,700,000 bales, or 100,000 bales more than any previous record. This result is entirely due to the great improvement that has been going on in the breed of sheep. Long ago Sir Samuel McCaughy could boast that, by introducing the Vermont strain into his flock, he had increased the weight of each fleece by 1 lb. of clean scoured wool, worth at a very moderate estimate an average of 1s. 6d. As at that time he had no fewer than 1,250,000 sheep, the enormous increase in his wool revenue can easily be reckoned. I know a run in Queensland, carrying 80,000 sheep, whose fleeces were doubled in weight in a single decade by the introduction of the large-framed South Australian sheep, and a similar result has been achieved on the largest sheep property in that State, carrying about 300,000 sheep or more, which yields a clip of more than 5,000 bales. But the most surprising figures are to hand from South Australia. Forty-five years ago, when I was at Bungaree, the sheep were considered marvels, because the average fleece weighed between 5 lb. and 6 lb. Now, it averages from 11 lb. to 13 lb., and lately a flock of wethers sold in Adelaide for shipment to Western Australia were machine-shorn before shipment, and yielded the enormous average of 16 lb. 14¼ oz. If the Commonwealth ever again possesses 105,000,000 sheep, the wool exports will greatly exceed 2,000,000 bales."

PANICUM MUTICUM.

Mr. C. Drieberg, Superintendent of School Gardens, Ceylon, has furnished the Editor of this Journal with the following interesting remarks on the grass known as *Panicum muticum*:—

I see that in your issue for November you called *Panicum muticum*, "Giant Couch Grass," a new name to Ceylon, where it is the chief cultivated fodder, and is known as Mauritius grass or more commonly water grass, owing to its affecting moist situations. The cultivation is very profitable, and hundreds of acres about Colombo are under it. As an element in the diet of milch cattle, it just takes the place of swedes, but is also largely employed for feeding horses. The grass is cut with a sickle, and made up into penny or half-penny bundles, which are carted about the town. With us it is always planted by cuttings, never by seed. Some dozen years ago, when I sent some bags of cuttings to start cultivation on the Poona Farm, I understood that it was practically unknown as a fodder in India.

A point to be remembered in the use of this valuable fodder is to cut (once in eight or ten weeks as advisable) before the grass becomes coarse.

The Orchard.

EXPERIMENTS IN PINEAPPLE MANURING.

The Instructor in Fruit Culture, Mr. A. H. Benson, is now carrying out some experiments in manuring pineapples on some farms at Nundah, the results of which will be awaited with much interest. One of the farms (known as Melton's) has been under pines for the past 35 years, and was noted for the quantity and excellence of the fruit produced there.

The experimental plots have been ploughed, cross-ploughed, and subsoiled, and the soil has been thoroughly worked to a depth of 18 inches. The method of applying the manure was to first open up deep furrows, then to broadcast the manure and stir it thoroughly into the soil by means of a narrow-toothed cultivator. The planting has been done somewhat differently to the method usually adopted, in that each plant has been allowed more room to grow than is usually the case, with the object of forming a good root system. The plants are put in, in double rows, at distances of 2 feet apart in the row, and the rows 21 inches apart; thus each plant is 2 feet apart from any other.

The manures employed were sulphate of potash, dried blood, and Thomas' phosphate.

Apiculture.

THE PORTER BEE-ESCAPE.

This ingenious contrivance, designed for automatically clearing bees out of supers, is so constructed that it effectually prevents the return of the bees when they have once vacated the super. Every bee has to pass between the points of two sensitive springs that readily yield as each bee passes outward, closing up and absolutely preventing its return. The apparatus is strongly constructed of tin, and when in use is mounted on a board, bee-spaced on one side, and the same size as the top of the hive. The inventor gives the following as his method of using the apparatus:—"With a screwdriver or pry loosen the super so that the propolis connections will be severed or broken. Now, with one hand tilt up the super at one end enough to make a gap, and with the other hand blow in two or three whiffs of smoke to drive the bees back. Next lift the same end of the super up a little further, so that it will stand at an angle of about 45 degrees. With the free hand lay down the smoker and pick up the escape-board, which should be handy. Slide this on top of the hive as far as it will go, bee-space side up. Let the super down on the escape-board gently, and, last of all, bring the escape-board and super so they will align with the hive." The best time to put on Porter escapes is late in the afternoon or evening. If thirty or forty of them are put on the evening previous, the next morning, about 9 o'clock, there will be the same number ready to come off with hardly a bee in them. If there are a few bees left, they will usually take wing as soon as the super is uncovered. If not, a little smoke and a shaking will soon dislodge them.—Exchange.

Poultry.

FATTENING POULTRY.

FOR EXPORT AND LOCAL MARKET.

BY M. FERN.

If highest market prices are to be obtained, it is only by getting the bird into the finest condition. The process is neither difficult nor costly. If a cockerel in store condition is penned up for from two to three weeks, a great gain will be shown, not only in weight, but in quality of meat, particularly in breast meat. This should always be the chief aim of poultry-raisers—to get the bulk of weight on the breast. It can be shown that, by getting another pound or two on to a bird that is in store condition, a return of double and, in some cases, treble its store value will result. This can be understood when the prices are studied for fattened and unfattened birds. In the case of the former, a bird weighing, say, 3 lb. nets 2s.—*i.e.*, 8d. per lb. By fattening or topping off and getting another pound, a 4-lb. bird will realise 4s. in the London market—just double the value. The flesh gain can be attained in a couple of weeks' feeding at a cost of 6d.; so that a grower practically raises another bird in two weeks at a minimum of cost and risk, as the most risky time of a bird's life is as a chick. So by pen-fattening the breeder gets a better and a quicker return than by the ordinary system of sending birds to market straight off the farm.

In England and Europe large establishments are kept going by this system alone. Birds are purchased from the farmers and fattened, and then sold at top figures; the fatteners making more out of a bird they keep for two or three weeks than the grower does who has to raise them till three or four months old.

There are several systems used, the most common of which is the machine-cramming process, when birds are artificially crammed by a machine worked by treadle, the food being forced through a tube into the bird's throat. Expert crammers can do hundreds in a day. A much simpler system for the farmer is the ordinary crate or pen fattening process. In the case of crate-fattening, the birds are confined in crates with stratted bottoms, large enough to allow birds room to turn round in, but not large enough to allow of exercise.

Birds are fed often on crushed grain mixed with separated milk, no whole grain being given. By this means all the bird has to do is to eat and grow fat.

Pen-fattening is an easier and cheaper way of preparing birds; but, of course, the same gain in weight cannot be shown. The birds are divided into small flocks of, say, twelve cockerels, and, placed in a small enclosure or covered run, are given partial exercise; and very fair results are attained. In each case cleanliness must be studied, clean water and grit must be provided. Either of the systems will prove profitable. In feeding, all grain to be given crushed; wheat, maize, oats, &c., boiled potatoes, oilcake, bran, pollard—all make good fattening mixtures; milk in any form greatly improves the quality and colour of flesh; foods to be mixed in a soft condition; enough to be given to enable the birds to clean up; no food to be left about to ferment.

Birds should be starved for a time before penning, to make them take the food offered under different conditions from those they have been used to.

DUCKS.

Ducks can be greatly improved by a little extra cramming. In the case of ducks, they should be kept going from their youth up, and the market age of a duck is at most twelve weeks. Fattening should be started much earlier than in the case of fowls. Their food should be given in a soft state, and any of the above-mentioned foods can be used, such as bran, pollard, maizemeal. Cooked meat should always form a large proportion of their ration; grit to be given, and green food.

Ducks should not be confined in crates, but the pen-fattening system can be used.

Geese, being waterfowl, may be treated in the same manner as ducks.

TURKEYS.

Turkeys cannot be confined in the same way. They should be placed in a small yard, and fed heavily on maize and wheat. Soft foods can be given in the morning, such as wheat or barley-meal mixed with separated milk. Cooked potatoes also make a cheap fattening food; grit to be provided.

GENERAL NOTES.

Note the condition of your birds. No bird should be penned unless in good health, as the extra feeding and no exercise would kill a bird that was not fit.

Provide clean water in all cases.

Males should be separated from females.

Birds should be kept quiet and in the shade.

All crates and runs to be kept scrupulously clean.

Feed only the best grains or meals.

Clean out the food trough regularly and often.

If birds go off their feed, give them a change; they must be kept going, or the process will be a loss.

Keep all birds of an age together; otherwise the older and stronger will get more than their share.

In sending to market, grade birds evenly as to quality.

EXPORT OF POULTRY.

Mr. Hyde, Poultry Expert, lately told an interviewer that the London and South African markets are very attractive just now for poultry exports from New Zealand. One Auckland firm was this season shipping to the London market 6,000 birds. More poultry would be shipped from Auckland this season than from any other part of the colony. The season at the State farms, both in regard to hatching chickens and eggs, had been the best on record, the increase all round being at least 25 per cent. over the previous year. The Auckland district is making the greatest progress in New Zealand in regard to the poultry industry. Next comes Canterbury, and then Otago, and the other provinces are forging ahead gradually, though not to the same extent as Auckland. One Auckland poultry farm will this year have an output of 30,000 birds; last year its output was only 16,500 birds. The egg-laying competitions have done a great deal to show people what there really is in the business.—"New Zealand Farmers' Weekly."

Tropical Industries.

THE SUGAR INDUSTRY, No. 2.

THE WORK OF THE SUGAR BUREAU.

(Compiled from the Annual Reports of the Bureau of Sugar Experiment Stations.)

BY THE EDITOR.

In the November (1906) issue of this Journal we published some account of the work of the Sugar Bureau, in so far as individual experiments in cane cultivation by farmers are concerned. These experiments were all carried out under instructions given by the Director of Sugar Experiment Stations, and proved to be very successful. Since the publication of the results, we have been gratified to learn that they have attracted considerable attention, and a wish has been expressed that such information bearing on the welfare of the sugar industry should frequently be given in the Journal. Inquiry has also been made as to the relative cost of manures, the relative and actual quantities of each kind of manure applied to the canefields per acre, the best way to apply lime, and the estimated quantity of lime which it would be advisable to apply per acre on the Mackay sugar lands.

One of the substations instanced was on the plantation of Mr. Ralph Reid, at Mundoo, Johnstone River, where 2½ acres, divided into five experiment plats, were devoted to the experiments. Continuing our account of the work on these plats, we will first consider the nature of the land on which the experiments were carried out. The soil is one of the poorest in the district, and had been exhausted by previous cropping, and it was approved by the Director on account of its very special and certain fitness to illustrate the effects of deep and thorough cultivation and of special manures which the soil analyses had shown were absolutely necessary. The results more than justified the experiments. they showed that, while *ordinary cultivation without manure* in the two crops—plant and ratoons—yielded 16·67 tons of cane per acre, the deep and subsoil cultivation, supplemented by specially selected manures, gave in the plant and first ratoon crops together a yield of no less than 47 tons per acre. (*See* Journal for November, 1906.)

The following tables, dealing with experiments by Mr. Reid in 1904, will prove of interest in this case:—

Area.	Cultivation.	Manures.	Tons of Cane.
No. 1, ½-acre	Deep—Subsoiled ...	Lime and manure	12 58
No. 2, "	" " ...	Manure	12·39
No. 3, "	" " ...	"	12·49
No. 4, "	" " ...	Lime and manure	13·38
No. 5, "	Ordinary	None	6·08

The manure was composed of lime phosphate, nitrogen (as sulphate of ammonia), and potash (as sulphate of potash), the cost of which is stated in the "Cost of Production."

In stating the cost of production, the whole of the deep and subsoil cultivation was charged against the 1904-5 crop, although the deep ploughing and subsoiling, as we have already shown, benefited the succeeding ratoon crops.

The whole of the manure was also charged against the crop under review, and one-third of the cost of the lime, lime continuing to have effects for several succeeding crops.

Cost of Production per Acre.

Cultivation.	Nos. 1 and 4.	Nos. 2 and 3.
	£ s. d.	£ s. d.
Ploughing and subsoiling	2 0 0	2 0 0
Putting trash in furrows	0 8 0	0 8 0
Cost of lime (one-third)	1 0 0	...
Applying lime (one-third)	0 4 0	...
Cost of manures	3 3 0	3 3 0
Applying manures	0 8 0	0 8 0
Cost of plants	0 12 0	0 12 0
Cost of drilling, cutting, and planting	1 10 0	1 10 0
Horse cultivation	0 8 0	0 8 0
Hand cultivation	0 7 6	0 7 6
Trashing cane	0 16 0	0 16 0
Harvesting	3 5 0	3 2 0
	14 1 6	12 14 6

Mr. Reid does not give the cost of production by ordinary cultivation in detail. We note, however, that in the case of the first ratoons this cost is set down at £2 15s., to which must be added cost of plants 12s., drilling and planting £1 10s., in order to approximately arrive at a cost of £4 17s. per acre, which may be near the truth, the total cost being £8 5s. per acre.

Value and Cost of the Crop per Acre.

Experiments.	Weight of Cane per Acre.	Value per Acre.	Cost per Acre.	Profit per Acre.
	Tons.	£ s. d.	£ s. d.	£ s. d.
Nos. 1 and 4	26·0	19 10 0	14 1 6	5 8 6
Nos. 2 and 3	24·8	18 18 0	12 14 6	6 3 6
Farmers' plat	12·1	9 1 6	8 5 0	0 16 6

Cost of Manure.

The cost of manures in any district depends to some extent on the expense of carriage. The heavy freight charges often militate against the proper fertilisation of farms and plantations.

In the case of the Mundoo experiments, the cost of manure is set down at £3 3s. per acre.

We have submitted this question of cost to the Director of Sugar Experiment Stations, Dr. Maxwell, and from data supplied by him we have arrived at the following results:—

	£ s. d.
50 lb. nitrogen, made up of $\frac{1}{3}$ nitrate of soda and $\frac{2}{3}$ sulphate of ammonia	1 5 0
50 lb. potash (sulphate of potash)	1 5 0
50 lb. phosphoric acid	0 8 0
Total	£2 18 0

The balance is the allowance for freight—that is to say, at £1 per ton freight, the manure costing £2 18s. per quarter-ton, the freight comes to 5s., thus making up the £3 3s. per acre, as above stated.

The freight cost is taken as "bulk freight." The larger the quantity shipped, the less the freight charge.

LIME.

The application of lime depends, as to the quantity and quality, on the class of soil to which it is to be applied.

1. For land rich in organic matter, in districts where there is a heavy rainfall, burnt lime should be applied, the lime being ground as fine as possible, and put on the land in an unslaked condition and immediately covered up with soil, so that all the chemical changes may take place in the soil instead of in the air. The unslaked lime takes up the moisture from the soil, and becomes then reduced to a fine powder, which mixes intimately with the soil. From ½-ton to 1 ton may be applied, according to the need of the soil. It is inadvisable to put on heavy applications in wet districts, as much will be carried off by heavy rains. The rule should be—small and frequent doses.

2. For dry land low in organic matter, apply lime in the form of finely ground carbonate. Such lime is usually not acid. If burnt lime is applied to such soils, the tendency is to burn up whatever organic matter there is. Hence the advisability of using carbonates. In clay lands, burnt lime would give good results.

THE BANANA INDUSTRY.

The importance of establishing a banana industry in Surinam (Dutch Guiana, in South America) has long been recognised by the Dutch Government of the colony, and active steps have been taken to give practical effect to the idea. The Demerara "Argosy" says that a contract has been entered into by the Government and the United Fruit Company in regard to the purchase and delivery of bananas.

By this contract the planters of the colony bind themselves to plant 2,470 acres in bananas, and to increase the productive area within three years to a minimum of 7,410 acres. On the other hand, the company agrees, for a minimum of 20,000 bunches, to send a boat to Dutch Guiana to buy and transport the same. At first the service will be a fortnightly one; later on, as the supply of fruit increases, boats will call weekly. The contract sets out in detail the prices to be paid for the different grades of fruit during the different months of the year. The highest prices will be paid during the months of March, April, May, June, November, and December. No doubt every effort will be made by the planters, by the careful pruning of suckers, to get the majority of the bunches to mature during these six months.

In view of the possible establishment of a regular banana industry in British Guiana, the Demerara "Argosy," in publishing the terms of the Surinam contract, publishes also useful information in connection with the prospects of banana cultivation, obtained from a Jamaica banana-grower who has been engaged in the trade for a number of years.

The authority places the cost of preparing and cultivating an acre in bananas at about 40 dollars. This estimate would appear to be rather low. The Hon. William Fawcett, in a paper on the banana industry in Jamaica, read before the West Indian Agricultural Conference of 1902 (*see* "West Indian Bulletin," Vol. III., pp. 153 *et seq.*), places the cost at £15 per acre in the irrigated districts and £10 on the north side plantations. To this must be added the cost of obtaining suckers from Jamaica. These could be purchased at about £1 per 100 suckers. This, with transport charges, would bring up the cost, on the estimate of 40 dollars, to about 60 dollars per acre. Below

will be found an estimate of the receipts, from which it will be seen that the first year's income will practically pay for the establishment of the plantation. The probable annual expenditure for upkeep after the first year will be about 36 dollars. The profit during the second and subsequent years may, therefore, be placed at from 25 dollars to 30 dollars per acre.

The statement published on p. 308 shows that during the six months already mentioned the maximum price of 35 c. per 9-hand bunch will be paid to the Surinam growers; during the other months, 20 c. The price for 8-hand bunches will be 23 c. and 13 c., respectively. After the first two years, the prices will be somewhat lower.

In regard to the prices paid for bananas by the United Fruit Company in Jamaica, it should be mentioned that many of the growers are under contract to supply fruit all the year round at the following rates per 100 bunches:—January, £6; February, £7 10s.; March, £10; April and May, £12 10s.; June, £11 10s.; July, £7 10s.; August, £5 10s.; October and November, £6 5s.; December, £5 10s. Penalties are enforced in the event of failure to supply the stipulated quantities. Most of these contracts expire this year, and, as the ruling open market price for the last two years has been considerably lower, contracts are not likely to be renewed at the above-mentioned figures. These prices are for full or "straight" bunches—*i.e.*, of 9 hands and over. An 8-hand bunch counts as three-quarters, a 7-hand as one-half, and a 6-hand bunch as one-fourth.

The Jamaica grower referred to above estimates that the average number of trees planted to the acre is 300. The number of saleable bunches yielded by these depends very much on the fertility of the land. On good land an average of 270 bunches should be obtained, of which 60 per cent. (or 162) should be of 9 hands and upwards, 25 per cent. (or 67) of 8-hand bunches, and about 40 7-hand bunches. After the first year it is estimated that an acre should yield 400 bunches as long as the land remains good (the grade proportions being the same as in the first year). Calculating these returns in accordance with the Jamaica system already outlined, the yield would be equivalent to 232 "straight" bunches in the first year and 345 in subsequent years.

Assuming that a contract, similar to that made by the Surinam Government, could be made by British Guiana, the "Argosy" gives an estimate of the probable revenue from banana cultivation, as follows:—First year, 59·96 dollars; second year, 89·10 dollars; subsequent years, 86·22 dollars. In making this calculation, "no credit has been taken for the production of a larger proportion of bunches in the months of highest prices, which is the aim of all growers of bananas under a contract such as this. It has been assumed that throughout the year the same number of bunches would be cut every month."

It will be understood that the foregoing remarks apply to the cultivation of the Gros Michel banana, the variety grown in Jamaica.—"Agricultural News," Barbados.

BANANA FLOUR.

BY C. DRIEBERG.

For the following conclusive information on the possibilities of banana flour, we are indebted to the "Ceylon Tropical Agriculturist." We frequently receive inquiries as to the method of production, cost of production, market value, &c.; and we trust that the following information will satisfy our readers that the production of banana flour would prove anything but a paying speculation:—

Introduction.—The idea of a local industry in banana flour has occupied my attention since 1898, when I submitted two reports on the subject which were issued as Government Circulars (227 of 9th December, and 150 of 5th

August). My attention was first drawn to this matter by Mr. Chas. Stouter, the Head Clerk of the Anuradhapura Kachcheri, at present of the Audit Office, who submitted a sample through the Government Agent. (I may mention, in passing, that Mr. Stouter was in 1900 awarded a gold medal for his exhibit at the Paris Exposition.)

Name.—In view of certain important considerations, it is necessary to distinguish between bananas and plantains. The popular distinction is based on the fact that the banana is eaten raw and the plantain cooked. In this way the banana might be termed a "fruit" in the popular sense of the term, and the plantain a vegetable. But, as Dr. Watt remarks, the two terms are very loosely used—some apply the name "banana" to the round, plump, thin-skinned variety, while others employ it in referring only to the small-fruited kinds. Watt recommends that the name "banana" should be discarded, and only the word "plantain" used. In Ceylon this is the case, but it would be difficult to entirely eliminate the term "banana," which should, however, always refer to the "table plantain."

In the manufacture of flour, it is the banana and not the plantain that should be used, and for the following reasons:—(1) Because the former is more extensively cultivated; (2) because its yield is larger; (3) because the quantity of raw material required for producing a given quantity of flour is much less.

Uses.—Banana flour is at a decided disadvantage when competing with cereal flours, which are much more cheaply produced. Its chief importance is as a diet for invalids and infants, for which there is no question as to its value. H. M. Stanley has spoken in high terms of its efficacy in gastritis, and the testimony of physicians in India and the West Indies is forthcoming to prove its value as a food for those suffering from dyspepsia, dysentery, and similar ailments. In a report made in a sample sent to the Paris Exposition special reference was made to its suitability in cases of diabetes.

Manufacture.—According to Herr Leuscher, who apparently has had considerable experience in this matter, 10 bunches of 30-40 lb. each will make 1 cwt. flour—calculating that 20 per cent. goes away as peel or skin, and 55 per cent. out of the balance as water. This calculation, however, does not make any allowance for wastage, and is greatly in excess of yields in Indian and Ceylon experiments.

According to Herr Leuscher, $2\frac{3}{4}$ cwt. fruit will yield 1 cwt. flour. According to Indian experiments, conducted by the Director of Saharanpur Botanic Gardens, who used Ryder's American evaporator, $8\frac{3}{4}$ cwt. of fruit are required to produce 1 cwt. flour—*i.e.*, only about 12 per cent.

In Mr. Stouter's experiments the yield was almost identical with the last; but, 12 per cent. seems a very poor yield, and I am inclined, from my own experience, to put down the average weight of fruit required to produce 1 cwt. flour at 5 cwt., the percentage of flour to fruit working out 20 per cent. One way of accounting for the high percentage given by Herr Leuscher is that he was dealing with comparatively large fruits, for he takes the average weight of one as $5\frac{1}{3}$ oz., so that only three fruits would go to the pound, while with our ordinary small plantains about ten go to make up a pound, and as a result a larger proportion goes away as peel.

The method of manufacture, shortly stated, consists of drying and reducing to powder. The desiccation may be by sun heat or with the aid of a dryer or evaporator, while the reduction to powder can be done by means of a mortar and pestle or a grinding machine.

Cost.—I have not been able to get at any reliable figures as to cost of production in the West, but Indian experiments show it as nearly 40 cents per lb.—that is, nearly Rs. 900, or £60 per ton! According to Mr. Stouter the cost per lb. was 16 cents—*i.e.*, Rs. 360, or £24 per ton. These figures represent cost of production at the places of manufacture—at Saharanpur in India, and

Anuradhapura in Ceylon respectively—so that cost of packing, rail freight, shipping charges, and what not have to be added.

Sale Price.—Taking £27 as the maximum price—which a London firm is said to have offered to give per ton—there is still little prospect of a remunerative trade in banana flour; but when we hear of £8 and £5—the figures given in Prof. Dunstan's report—there can be no hope whatever of a paying industry being established in Ceylon. Among inquiries I received from abroad was one from the manufacturers of a well-known brand of infant's food, who made the magnanimous offer of 70s. to 75s. per ton c.i.f., which works out at something less than ½d. per lb.

Buyer v. Seller.—It would interest you to hear what has been said from the buyers' as well as the sellers' point of view.

The following is taken from a letter written by a West Indian manufacturer:—"With reference to banana-meal, there is really no market or outlet for it, and I have been working the thing for all it is worth, and have spent £300 over it, trying to get a satisfactory market, but all to no purpose. Quotations have been made by a London firm of £27 per ton, ex warehouse and docks, London. I have offered to supply at these rates—they were simply booming it. I have sent tons of meal to various countries, all to no purpose, as the market seems to want it to compete with wheat or rice."

On the other hand, a leading London firm writes:—"The position of the article is that the present supply is more than sufficient to meet the demand. Two years ago we had small buyers at 30s. to 35s. per cwt., but we found that the planters then were only able to supply it in spasmodic quantities, and we dropped the matter. . . . Within the last few months we have had inquiries from planters said to be able to produce in regular quantities, but the trade here is so very small that it is not worth our while to bother about it, particularly after the time and money we have spent in trying to find a market. We are not inclined to waste further time and money on the article until we see a regular demand for the flour as well as a regular supply."

But before a regular supply could be assumed a satisfactory market rate must be established.

With the present steady demand for bananas and plantains as fruits and vegetables, and the facilities that are being afforded for rapid transport by rail, I am not sanguine of a local trade in banana flour being started.

The following is a letter on the subject received from Professor Dunstan, of the Imperial Institute:—

Imperial Institute road,
London, 24th November, 1905.

SIR,—I have to acknowledge the receipt of your letter, No. 2,851/J, dated the 5th October, 1905, inquiring for information regarding the present market for banana or plantain flour. The Imperial Institute has received a number of inquiries upon this subject from various colonies, and samples of the flour have been forwarded for examination from Fiji and Seychelles. Within recent years banana flour has been introduced into this country from the West Indies, and a limited demand for the product has been created. It is used in conjunction with other materials for the preparation of bread, invalid foods, and other dietetic specialties. The present consumption for these purposes appears to be only small, though it is difficult to ascertain the exact amount, as the material is imported direct by the firms interested, and the quantity is too small for separate mention in the trade returns. The Imperial Institute has been informed recently by a firm dealing in banana preparations that the present consumption in this country does not exceed 50 tons per annum. Larger quantities are said to be used in the United States, but the importations into that country cannot be ascertained from the official statistics. It appears to be generally agreed that these banana preparations—flour, foods, &c.—will require extensive advertising if any large demand is to be created, and at the

moment very little is being done in this direction. At the present time £20 per ton is being paid for supplies of banana flour suitable for the purposes already indicated, but it is doubtful whether this price could be maintained in the event of large consignments being placed upon the market, unless the demand for the products could be correspondingly extended. The use of banana flour is at present restricted to these special preparations, but there is little doubt that it could be sold for many other manufacturing purposes if it could be placed on the market at a cheap rate. It would have to compete in this case with other farinaceous material selling in London at from £6 to £12 per ton, and it is a question for local consideration whether a trade upon these terms would be remunerative. Brokers who were consulted upon this point stated that, if consignments of 50 tons or so per month could be regularly supplied, they thought the material would meet with a ready sale, and quoted provisional prices of from £5 10s. to £8 per ton, c.i.f. in London, according to quality. They stated, however, that the only way to make the material more widely known amongst manufacturers who might be able to use it would be to forward a small trial shipment of 20 to 30 bags, of about ½-cwt. each, which could be distributed to likely buyers for practical trials. By this means the possibilities of the material would be determined, and its commercial value definitely ascertained. If further action is considered desirable, samples of desiccated bananas and banana flour prepared in Ceylon should be forwarded to the Imperial Institute for examination and comparison with the products upon the market. The Imperial Institute will be glad to be kept informed of any developments which may occur in Ceylon in reference to this matter.

I am, &c.,

(Signed) WYNDHAM R. DUNSTAN.

THE POSSIBILITIES OF RAMIE.

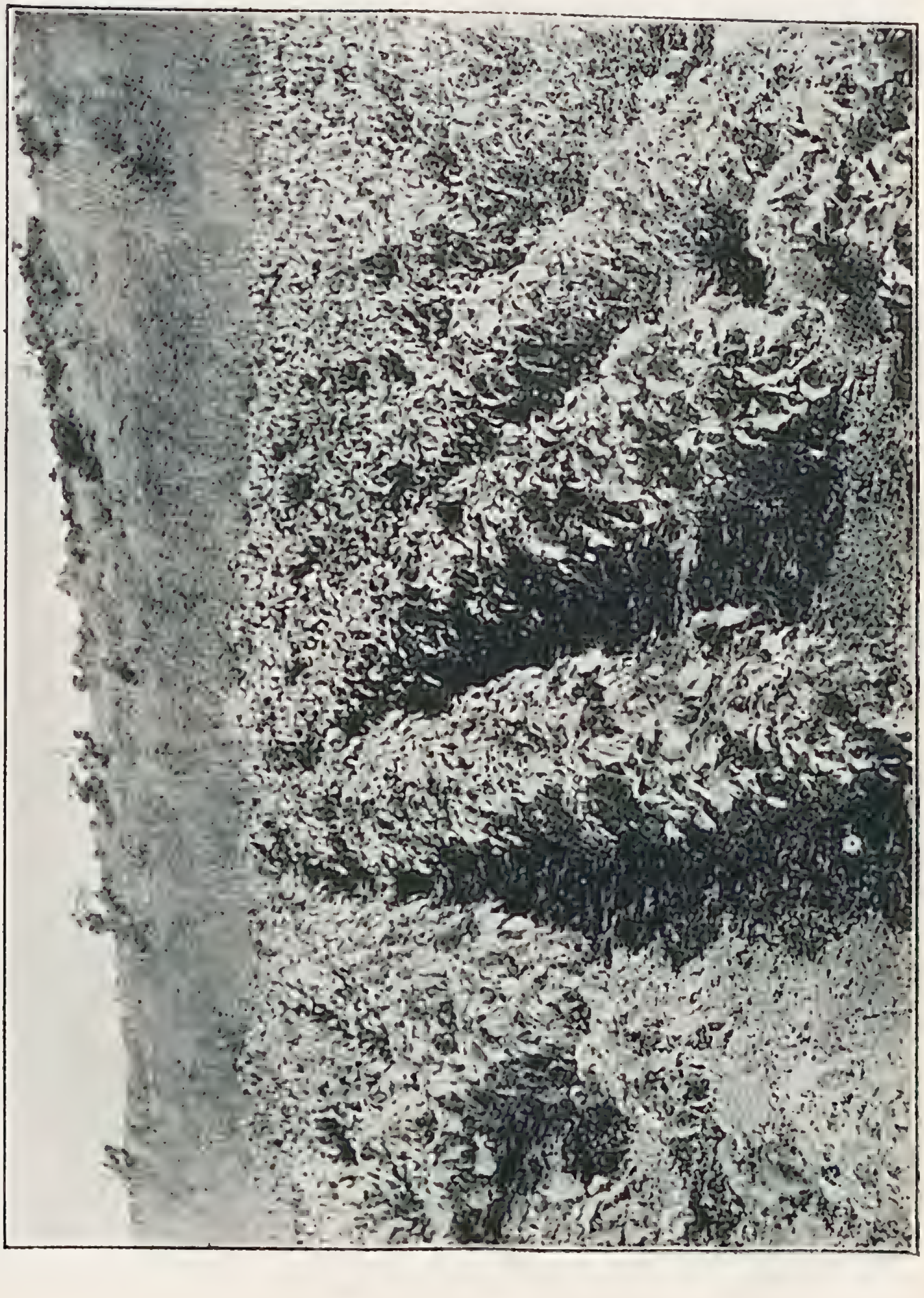
The following extracts are taken from a very interesting paper on the possibilities of ramie, by D. Edwards-Radclyffe, in the "Quarterly Journal" of the Liverpool University Institute of Commercial Research in the Tropics. After detailing the various uses of this valuable fibre, the writer says:—

Its present high price is prohibitive. As a remedy, we must create a demand in proprietary articles, specialties beyond competition, and so induce the manufacturers to employ and the planters to grow—though from a planter's point of view the inducement to cultivate is already enormous. The plant is easily grown, requiring little or no attention beyond the ordinary hoeing, mulching, weeding, and like attention. It does not spoil if not harvested at a given moment. It lasts without trouble for sixteen or eighteen years. These are no small advantages to a planter.

Now consider the aspect of profit. I have shown it can be advantageously used in any textile industry, but it cannot be done at present competitively, as the present small area of cultivation keeps up the price. We have evidence that it can be grown and sold at a paying profit for £10 per ton; at present it fetches £37, leaving a margin of £27. At £30 per ton in the raw it would be on the border line of flax, opening up that market; at £20 it would be used by the cotton manufacturers, and at £15 it would reach the jute margin. Even, therefore, at its lowest price, it would show a £5 profit beyond that which planters assure me they would be prepared to take. There is no reason to suppose the lower price would be reached at once. Many years of high price and large profits are open to the farmer.

All this is based on the present and expensive method of harvesting. We will assume that a plantation has been laid down as described in Dr. Drabble's paper. The harvesting is done by selecting the stems as they ripen. The

Plate V.



Ramie-growing in Rhodesia.

Plate VI.

RAMIE.
Boehmeria nivea, var. tenacissima.

RAMIE.
Boehmeria nivea.

sticks should not be cut too close. They are trimmed, top points cut off, divested of lateral shoots and leaves. (It is a fitting opportunity here to correct an error that has crept in—viz., that the leaf pulp is useful for paper-making. My words are "the fibres in the leaves and lateral shoots."* I feel convinced this could profitably be used, as also the gummy matter, which, I am informed, is valuable, though I am not in a position to vouch for it, as it has not been produced in sufficient quantities to test its commercial use.) The stick can then be scraped, not too harshly, to divest it of its brown pellicle or bark; the ribbons are next stripped and passed through the thumb and finger, or over an iron or hardwood bar fixed to a table or trestle. This squeezes out much of the gummy matter. The material is then rinsed in water and dried. Another method is to trim the sticks as above and strip the ribbons by drawing them through the thumb and finger or over a sharp-edged bar of iron or wood, under slight pressure of the other hand, in order to divest them of gum and pellicle, and then to rinse and dry them, care being taken in both methods to keep the fibres parallel. This is the Chinese method, and must be generally adopted until our plantations are large enough to employ mechanical means. Ribbons sent with the brown bark, and no attempt made to clean them, are difficult to treat, and command a poor price. Undoubtedly the proper method is to filasse or clean the fibre at the place of production, and it has many advantages.

Machinery might be used for decortication and partial degumming. The fibre would then in its green state be treated and the gum extracted, and a beautiful filasse, lustrous and strong, would result. It would pack easily, and the saving in freight would more than compensate for the cost, while the higher price obtainable for the clean fibre would be an additional inducement to set up a degumming plant.

There would also be the saving in drying and handling. It is quite a mistaken notion to suppose that ramie fibre is improved by the solidification of the gum; the fibre is more difficult to clean, and loses much of its natural beauty by the rough and ready methods now adopted; in my opinion, this has been the chief factor in delaying the introduction of the fibre. Its treatment has been found so difficult that it has been pronounced insurmountable, and colour has been given to this by the handsome prize offered by the Indian Government for an impossible machine—an offer withdrawn as far back as 1881. Because the prize was not awarded, it has been assumed that the process of proper treatment had not been discovered.

I am of opinion that no real progress will be made till our planters have demonstrated how easily the plant can be grown. Five shillings and sixpence spent on seed would be ample to start a very large plantation. The seed once germinated is pricked out, and when plants are a few inches high they should be transplanted to a nursery patch, where the plant should be allowed to grow at will, and all lateral shoots encouraged, the larger ones pegged down, nicked in several places, when they will strike. The upper stems serve for cuttings. It is also propagated by the division of roots. I am repeating this, as it cannot be made too clear to the planter how easily and rapidly he can produce a stock of plants at comparatively little cost.* If roots have to be imported, it would prove a costly operation.

The plantation once established, the ribbons must be stored; if properly dried they will keep any length of time, till there is sufficient quantity to make a consignment. One feature stands out prominently—viz., that it is possible for a planter having land to commence ramie planting at once, and cultivation

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* An instance of the rapidity with which the plant can be grown may be given. I sent out seed to one of our colonies, and within nine months it has been in my hands to report on as fibre, thus proving how rapidly the plant will yield a return, and each year the yield increases. This is a fitting opportunity to amend the statement that the plants crop once or twice, then deteriorate. I have grown ramie many years, and known of experimental plantations existing here for a considerable time, but instead of growing weaker the plant grows stronger. I have stems cut last autumn now in my office which were considerably over 8 feet in height when growing.

will go on apace without capital being required. It is in his power to treat his crops by hand as the Chinese do, and store his production till its bulk warrants exportation. The plantation goes on increasing in area until such time as the crops are large enough to handle by machinery. Then a change will come over the scene, and extension can go on very rapidly. Decorticating machinery can be employed and degumming stations established, and the produce treated by machinery into filasse. When the planter finds that his plantations are large enough to employ machinery, he can have decorticators at a cost of about £50; but, once he is in a position to employ these, capital will be easily found to put up filassing stations. A good plan would be for the planters to combine and set a station in their midst. Not only would they have the filasse, but they would find it profitable to treat the by-products, such as gum and fibre from lateral shoots. It is in this form that it will ultimately find its way into our market. I am of opinion that it will be possible to send filasse into this country considerably under the price of cotton. The area in which it can be grown is considerably wider than the cotton area; it grows where cotton grows, and in vast areas where cotton cannot grow. Even in England and Ireland it will flourish.

I see possibilities in most of the colonies of carrying the manufacture as far as spinning and weaving. It is just such an industry as this which would make a colony. The world's population increases faster than the area of cotton-growing. Ramie is an admissible clothing material, and it will find a ready sale if the agriculturist will make supplies adequate for the manufacturers' requirements.

One very serious drawback to the extension of the ramie industry is, as I have stated, the dependence on one country for supplies. What we receive differs so vastly, and gives a series of difficulties which militate against perfection—1st, erratic supplies; 2nd, the tendency to increased prices; 3rd, the inferior qualities and the loading of inferior and unselected material to make weight. Much of the inequality is produced by the mixed samples and the introduction of dead fibres, which are the cause of hard ends, tapes, nips, and other troubles so detrimental to a perfect spinning.

All this would be obviated by my system of filassing on the spot. It not only would not pay to load them in the bulk, but they could be treated to obtain perfection. The selection of the material and its conversion into filasse at the place of production is essential. Inspecting filasse would show at a glance the bulk. The importation of filasse would enable manufacturers to purchase the raw material and treat it on existing systems.

When this is accomplished, an era of prosperity for our colonies will open up, and the nightmare of cotton crises, with their attendant loss of capital and privation miseries for the workers, will be a thing of the past. If only a tenth part of the money lost in a single year of a cotton crisis were expended in establishing ramie cultivation, it would banish them once for all and be far more efficacious than any legislation. The shortsightedness of our manufacturers in the commencement of the cotton crisis should act as an incentive and a warning. Had we thought less of the manufacture and more of the supply, we should have secured our own base. This may react now in the establishment of a new industry (ramie), which can be Empire-wide and bring incalculable blessings to the whole British people.

SUGAR-GROWING IN JAVA.

The following extract from a recent report of the Bureau of Labour of the Department of Commerce and Labour will be read with interest, showing as it does existing conditions on the island of Java, which has an area of about

49,000 square miles, and has a population of 29,000,000, of which 63,000* are Europeans. It says:—

Cane-raising affords the most wage employment of any agricultural industry in Java. Sugar cultivation was first initiated by the Government under the system of forced culture, but has long since passed into private hands. Much of the land occupied by the plantations is leased from natives, in accordance with the regulations previously described. The plantations are entirely in eastern and middle Java, and in the former districts the workers are Madurese. They are paid usually on a day-wage basis. But around Passoeroean, in the extreme east, cultivation contracts are used to some extent, and two of the thirty-eight mills in that vicinity depend upon cane bought from local planters who are mostly natives. The custom of making a gang of men jointly responsible for all advances paid to its members is common. To a certain extent cheapness of labour is said to have discouraged introduction of machinery, especially for loading cane. The proportion of Europeans to natives employed on the plantations is very small. On one plantation visited near Surabaya, where in the mill alone 120 men were employed, or sixty to the watch, there were only seven whites, including the manager, upon the pay rolls in both manufacturing and planting departments. Field hands are paid 8 cents a day without rations in East Java, and get 2·7 dollars an acre for cutting. In the province of Kadoe, in middle Java, the rate was about the same, varying from 6 to 10 cents a day. In this district the more common method of paying for field labour is by the stint, but earnings average the sum just mentioned. Cane is stripped, but on the older plantations it is no longer possible to ratoon. Native overseers are employed almost exclusively for field supervision, though they are under the general direction of Europeans. One European to every 350 or 400 acres is considered sufficient, with a half-caste assistant during the busy season. Planting and cutting usually come together in Java.

The Madurese, who possess more typical Malay characteristics than the Javanese proper, give evidence of a lawless and probably revengeful disposition in their habit of burning the cane of planters against whom they have a grievance. Whether this is always a method of silently remedying real abuses is not clear. In several cases where offenders have been detected and punished, it appeared that they were not employees of the plantation where the fire occurred, and were actuated by little else than love of mischief and excitement in their incendiary undertakings. These fires are on the increase. Those occurring in a single district rose from 29 in 1889 to 218 in 1899, and to 616 in 1903. Mills have never been burned in this manner. The labourers will strive to destroy new and soft cane, especially seedling crops, which they find difficult or disagreeable to strip.

European employees are generally well paid, especially in comparison with the low salaries of white workers in other occupations in Java. Some managers receive 400 dollars a month and 10 per cent. of the net profits of the plantation. Head engineers are paid up to 250 dollars a month. In 1899, the average cost of making a short ton of sugar, including all expenses, except those for new machinery, improvements, and new areas brought under cultivation, was 29·70 dollars, and on one plantation in 1903 it was 26 dollars a short ton. For the plantations mentioned the former year, dividends averaged 15 per cent. Possibly the cost of production is falling not on account of the growing competition for employment, but to an increasing population, for wages are said to be decreasing throughout the sugar districts of Java.

An average of about 12 per cent. sugar is obtained from the cane of the better Javanese plantations, and the yield per acre is about 4·5 short tons. Fertilisation and intensive cultivation are practised, and attention is given to selected varieties and seedling cane.—"Tropical Agriculturist."

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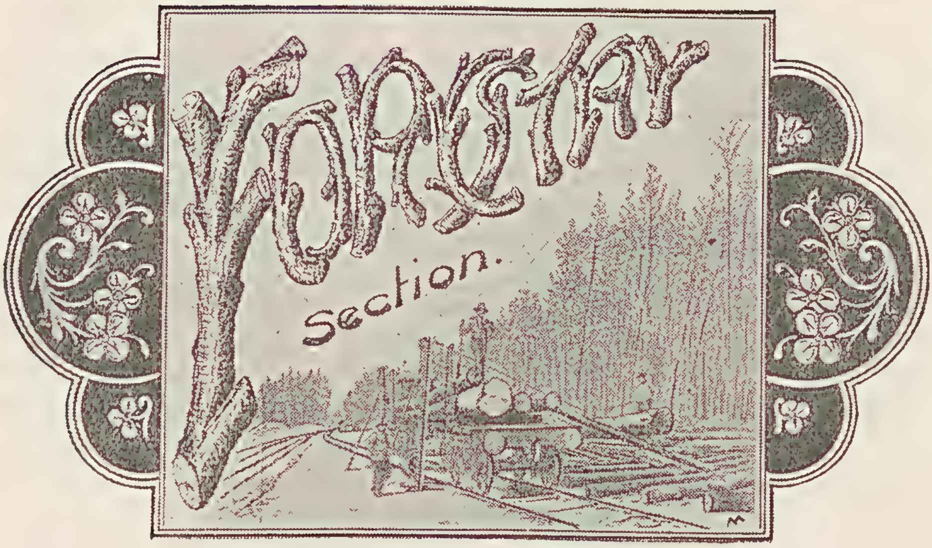
* All who have any European blood in them are counted as Europeans.—ED.



FORESTS AND MOISTURE.

In compliance with a request from one of our country readers, we republish an article on the above subject which appeared some years ago in this Journal, and in which we combated the opinion held by some that the destruction of forests has no effect upon the rainfall of a country:—

Although much has been written on the question of the connection between forests and rainfall, and many arguments, *pro* and *con.*, have been brought forward, we seem to be no nearer to unanimity on this important subject. But there are cases in which argument brings enlightenment. It is easy to affirm that forests do not increase the rainfall or moisture of a district, but there are local conditions which have to be taken into consideration which materially modify any statement in favour of or against increased rainfall due to the timber covering of the soil. It needs no very acute reasoning to show, by an examination of our own forests and scrubs, that they are important factors in restraining evaporation, retarding or even preventing heavy floods and the washing away of hill-sides, and consequently retaining the supplies of rivers and springs in the bowels of the earth. So much has been granted by all who have scientifically considered the matter. Compare a clear, open eucalyptus forest with no undergrowth with a dense vine scrub. The winds have free play through the former, whilst the heavy timber and undergrowth of the latter present an almost impassable barrier to even heavy gales. What is wind? Wind is air in motion, and air in motion is a very rapid worker. As it sweeps over the bare surface of land or water, it carries away with it more moisture than is evaporated by the heat of the sun. Still air, on the contrary, very slowly absorbs moisture. The air in the scrubs is still, and hence the moisture in the thick carpet of humus in such places is very slowly evaporated, and is being constantly renewed by heavy dews and showers of rain, which supply far more than is carried off in the air. This gives the superabundant water time to sink slowly into subterranean reservoirs, which, being constantly saturated, are able to keep up the supplies drawn upon by streams and springs. When heavy rain is long continued, when there is little or no undergrowth, the surplus water rushes off the sun-dried surface of the soil, pours into the creeks, and swells their water faster than the rivers or lakes to which they are tributary can carry them off. Hence arise often devastating floods. In the scrubs, on the other hand, the flood waters are retarded by the undergrowth and the mat of roots

traversing the soil like a close network, and before they can get away to the creeks in injurious bodies they sink through the porous soil to the regions below, and so are prevented from flooding the low-lying country.

Usually after heavy rain in Queensland, strong, drying, westerly winds sweep over the country, and the open forest is rapidly deprived of much of the moisture which has remained in the soil, and is left in perhaps a worse position than before the rains. The scrubs will not permit the drying winds to sweep through them, so that the moisture is retained in the soil. The still air above it absorbs this moisture very slowly until it has become saturated. Once the point of saturation is reached, evaporation ceases, and under certain conditions condensation and precipitation follow. This precipitation may take the form of heavy dews or of *rain*. In this sense, then, it may be asserted that forests increase the rainfall. Moist air being lighter than dry heated air, the former will ascend and assist in forming rain-clouds, which, when fully charged and reaching a stratum favourable to condensation, must fall in the form of rain, but not necessarily in the district where they were formed. Having risen above the protecting influence of the scrub, they are caught by the winds and swept away, joining other clouds on their way. Perhaps they reach a high range, on which they impinge, and rolling upwards reach a cooler atmosphere, and at once condense and fall in grateful showers, perhaps 200 or 300 miles from the forests which gave them birth.

Professor R. C. Kedzie, Chemist of the Michigan Agricultural College, tried an experiment to obtain some measure of the relative rapidity of evaporation in a draught and in comparatively still air. The air in one part of the chemical lecture-room was so nearly still that a feather would not move perceptibly. By opening windows in another part of the room, a strong draught could be obtained at one window, the wind blowing 12 miles an hour. Two square pieces of Turkish towelling of the same size were thoroughly wetted, just short of dripping, then weighed separately, one suspended in the still air of the room for an hour, while the other was similarly hung in the draught by the window or in the mouth of the ventilating shaft. Both were left for an hour, then weighed again, and the loss in weight showed the amount of water evaporated in each case. The trial was made seven times, with the result that the evaporation was four times greater in the draught than in the still air. The actual amount evaporated was not the same for each hour, but the ratio of evaporation was almost identical in the whole series—viz., four times as much in the draught as took place in the still air.

The reason for this is not hard to find. A volume of perfectly still air surrounding a wet body will take up moisture with progressive slowness till the air is saturated; but, if this damp air is blown away and replaced by relatively dry air, evaporation will go on with increased rapidity, and if the air is constantly renewed, as in a draught of wind, the evaporation will be more rapid. Every washerwoman knows that the clothes will soon blow dry when hung out in a stiff breeze, but will take hours if lined up indoors.

The principle of the professor's laboratory experiment, he says, will hold in the broad open of Nature. The air in contact with the moist ground will take up water till it is saturated, and then evaporation will be suspended, provided the air remains still and undisturbed. But, if this bottom air is swept away by wind, evaporation will be renewed, and the drying of the soil will again go on. The influence of trees, shrubs, and even of the grass in preserving in some degree this shallow pool of quiet air at the ground-level, and thus diminishing evaporation from the soil, may seem a trifling matter at first thought, but becomes of great moment on the large scale of Nature.

From this it will be seen that my theory is fully borne out by Professor Kedzie.

DEPLETION OF FORESTS IN NEW SOUTH WALES.

The Engineer-in-Chief for Railways in New South Wales, Mr. H. Deane, has pointed out, in a paper prepared at the instance of the Minister for Works, the ever-increasing scarcity of timber suitable for railway sleepers, bridges, buildings, &c. He says:—

The forests have now almost been entirely exhausted of timber anywhere within reasonable distance from the means of obtaining railway and steamship transport. Timber-getters and sawmill owners have to push further back into the country to obtain supplies for the constantly increasing demand. Especially is this the case with ironbark, but to a greater extent it also applies to other hardwoods.

And the time is not far off when, instead of New South Wales being looked upon as a country with a superabundant area of forests, it will reach the condition of those countries where more expensive materials have to be used for construction in substitution for timber.

The importance of this step is all the greater when it is considered how large a quantity of the colony's most valuable timbers are exported to other parts of the world, and of late particularly to New Zealand, and that, with the exception of the wages paid to timber-getters and the profits of timber merchants, the colony gains nothing herself, but is gradually being drained of one of her most valuable assets, and no steps are being taken to reaforest the districts as they become exhausted.

The ignorance of the benefits to be derived from proper management of the forests is very remarkable. We are possessed of timber which in strength and durability can vie with the products of all the world, and a large revenue could be made out of it. Forestry is, as has been happily said by Professor Bailey Balfour, a division of rural economy which ought to be the basis of a large national industry.

Forest conservation does not mean that no trees shall be cut down, but that the forests shall be cultivated as any other crop, and not wasted. Steps should be taken to prevent the spread of fire and the browsing of animals of all sorts on growing forests.

The matter is one generally for the State to take up; yet there are immense tracts under private control which would pay better as forest than as grazing land; and if proper instructions could be given, suitable schools of forestry instituted, men could be trained both for the employment of the State and to assist private owners. As the existence of even young plantations, which only their followers will reap the full benefit of, will mean the growth of, to them, an important asset, landowners should be taught to see that it is in the interests of their property to plant and conserve.

It is perfectly clear that, if on the forest land of the eastern slopes of the Main Range, where such land might be worth 1s. per acre for grazing purposes, it will pay to grow timber, then, in the interior, near the railways, the poor ridges, which are not worth 1d. per acre, would, if put under cultivation for trees, yield a very handsome profit indeed.

But it must be understood this expectation can only be realised if care is taken in growing the trees. They must be started in nurseries, planted out, and, until they have grown to a considerable size, must be properly fenced off, and protected from the browsing and ravages of animals and man. Strict measures must also be taken to preserve them from injury or destruction by bush fires.

It is certain that if proper measures were taken a profitable industry could be carried on, giving employment to large numbers of men.

A REASON FOR FOREST CONSERVANCY.

That it is high time drastic measures were taken for not only nursing our forests, but for planting trees in place of those removed, will be seen from

the present condition of the vast forests of the United States. There, the total forest area is estimated in round numbers at 405,000,000 acres, or 26 per cent. of the total area of the country; Alaska, 577,390 square miles, and the Indian reservations, 31,400 square miles, not being included. The present annual requirements for consumption of forest products in the United States are, approximately, over 24,000,000,000 cubic feet, made up of the following items:—Lumber market and manufacturers, 5,000,000,000 cubic feet; railway construction, 600,000,000 cubic feet; charcoal, 250,000,000 cubic feet; fences, 500,000,000 cubic feet; fuel, 18,000,000,000 cubic feet; mining timber, 150,000,000 cubic feet. At the present rate of cutting, the remainder of forest land in the United States cannot long meet the enormous demand on its resources. Of the two most important timbers for building purposes, the merchantable white pine of the north-west of New England is practically gone, very little remaining; and there remain of the merchantable long-leaf pine of the South only about 1,500,000,000 cubic feet. The valuable ash will probably be the first to be exhausted. Walnut and tulip trees are also on the wane. Forest fires are estimated to destroy values of about 12,000,000 dollars annually, but during the year 1894 that amount was lost in two States alone—Minnesota and Wisconsin.

Most of the States have awakened to the danger of the extinction of their forests, and have special commissions for their forestry laws. There also exists a national organisation known as the American Forestry Association, composed of delegates from all the States, which meets annually. In forty-four States the Legislatures have striven to encourage tree-planting by appointing a certain day in the year, known as Arbor Day, for the voluntary planting of trees by the people. In Queensland we also have established an Arbor Day, but only for the beautifying of State school premises by the pupils. In the United States, tree-planting has for its object the renovation of the forests, and is a very serious business. Large areas of timbered country, amounting in the aggregate to 21,379,840 acres, have been reserved by the State, and large sums have been appropriated for their survey and protection. Now, if an immense territory like the United States, once so heavily timbered in many parts that the idea of the forest supplies ever giving out was scoffed at as absurd, is alive to the stern fact that its timbers are practically exhausted, with how much greater reason should we in Queensland set earnestly to work to regulate the cutting of our forest and scrub timber, to preserve the young plants and saplings, to aid and stimulate their growth by judicious thinning, and by planting suitable trees in various localities?

This is, we are pleased to note, being carried out to some extent in the Far North, in the neighbourhood of Cairns, where some thousands of cedar and other scrub trees have been planted out. We have also a Forestry Department, through which regulations are made by which the indiscriminate destruction of young trees will be prevented, and which will aim at the perpetuation of Queensland forests.

TOBACCO SAMPLES.

We have been requested by Mr. R. Nevill, Instructor in Tobacco Culture, to direct the attention of growers of tobacco to an important point in connection with the forwarding of samples of leaf for examination and appraisement of value. Each sample to be reported on should have a tag on every separate parcel, stating the name and address of the sender. Inattention to this simple matter has given rise to much confusion, as it is quite impossible for the tobacco expert to make a report to the owners if the latter give him no clue to their identity.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

SIXTEENTH LESSON.

NITROGENOUS COMPOUNDS OF PLANTS: PROTEIN (ALBUMINOIDS AND PROTEIDS), AMIDES, ALKALOIDS, FERMENTS OR ENZYMES. ORGANISED FERMENTS. BACTERIA. STERILISATION.

Organic compounds which contain besides the usual elements also Nitrogen in their composition may be classified as follows:—

(a) *Albuminoids* or *Proteids* (*Protein*).
(b) *Amides.*
(c) *Alkaloids.*
(d) *Ferments and Enzymes.*

The most important class of nitrogenous compounds are the **Albuminoids.** Various terms are used by different writers, and we hear these compounds also called **proteids** and **albuminous substances.** Some consider these terms synonymous; others, again, attach slight differences to the terms, and use them for the classification of the compounds. It may be well to call the whole class of compounds, as first proposed by Chittenden, **Proteins.** All these compounds have the most complex constitution of all organic substances found in plant and animal life, and contain carbon, hydrogen, oxygen, nitrogen, and sulphur in slightly varying amounts—

	Carbon.	Oxygen.	Nitrogen.	Hydrogen.	Sulphur.
From ...	51·0 %	20·8 %	15·5 %	6·8 %	·4 %
To ...	55·2 %	23·7 %	18·0 %	7·3 %	1·9 %

All living cells contain Proteins, as the essential constituent of **protoplasm,** a peculiar slimy and jelly-like substance found in the cells, also in solution in the **cell sap,** generally associated with small amounts of phosphoric acid in the form of phosphates. Proteins are also found stored up in the cells of seeds and other plant organs as nitrogenous reserve food in the form of small irregular grains (*proteid* or **aleuron grains**). The seeds of all cereals (as wheat, rye, barley, &c.), of legumes (peas, beans, &c.), and many oily seeds (Brazil nuts, castor oil seeds, &c.) are rich in aleuron grains, and, therefore, very nutritious. The leaves, stem, bark, and roots of plants contain comparatively small amounts of albuminous substances, which disappear more and more as the plants mature. The tubers of our root crops—potatoes, beets, mangels—are rather poor in proteids.

Some of the proteins are soluble in water, but are easily changed into insoluble compounds by heating, addition of dilute acids, or solutions of metallic salts; others, again, are insoluble in water, but are soluble in very dilute solutions of alkalies, and can be precipitated from these solutions by the addition of alcohol, ether, tannin, and by solutions of many metallic salts, as copper, lead, &c.

In accordance with their chemical and physical properties, Proteids may be subdivided as follows:—

1. **Vegetable Albumens** resemble the true *albumen* or *white of egg*, as they are soluble in cold water, but are precipitated or coagulated when heated to about 70° C. They are found very widely distributed in plant life, and have

been isolated from wheat, rye, potatoes, and other plants (*Experiment* 108). The exceedingly complex constitution of these compounds may be learned from the chemical formulæ proposed by various chemists; for instance—

$C_{240}H_{392}N_{65}O_{75}S_3$ (Schützenberger).

2. **Vegetable Albuminates**, as **Legumin** or *vegetable casein*, found in large amounts in the seeds of beans, peas, lupins, lentils. They are soluble in water, and are not coagulated by heating, but may be precipitated by fermentation or by the addition of an acid. They resemble, as the name indicates, the albuminoid compound *casein* of milk (*Experiment* 109).

3. **Insoluble Proteids: Gluten**—the peculiar sticky, tenacious, tough, and tasteless grey substance obtained when a few grains of wheat are chewed for some time—is the most important member of this group. Gluten itself consists of different compounds—one insoluble in alcohol, and is called *vegetable gelatin* or gliadin, causing the peculiar stickiness of the gluten; and another insoluble in alcohol, *vegetable fibrin* (*Experiment* 110).

Numerous other vegetable Proteins, like *globulins*, *proteoses*, &c., exist, which, however, are of less importance.

Proteins are the most important constituent of foods and fodders, and no animal can live unless its food contains a certain amount of these organic compounds, which, on account of producing blood and muscles, are called the **flesh-forming constituents** of foods.

Amides, the second class of nitrogenous compounds, are found in plants, particularly in the green and immature parts. Large amounts are generally found in roots and tubers, as in turnips and potatoes, and also in the young leaves and shoots of grasses. These compounds consist of carbon, hydrogen, oxygen, and nitrogen, containing no sulphur. They are very soluble in water, and pass, therefore, readily through their membranes like cell walls, and are readily transported from one part of a plant to another. In all growing plants a continuous formation and decomposition of albuminoids must take place, and Amides must be considered as some of the intermediate products. As the plant reaches maturity, the greater becomes the amount of Proteins and the lesser the amount of Amides. It is not probable that Amides in foods help in the production of flesh, like Proteins, but still they have a certain amount of food value, as they produce heat and may help in the formation of fats. Well-known members of this class of organic compounds are:—*Leucine*, found in potatoes, pumpkins, and also in many animal substances like liver and spleen. *Asparagine*, found in the juice of asparagus, in the shoots of most leguminous plants, and in many roots and tubers. *Choline*, found in cotton seed, in beets and turnips, has a strong alkaline reaction, and possesses poisonous properties which have caused ill effects when feeding large amounts of cotton-seed meal to young animals. *Betaine*, found in beets and beet sugar, molasses, &c. Most of these compounds are organic acids in which Hydroxyl groups OH have been replaced by $-NH_2$ groups.

Alkaloids or organic bases. Members of this important class of nitrogenous compounds are found very widely distributed, and have generally powerful therapeutic properties, some of them being virulent poisons. They are generally found in small amounts in combination with organic acids, as malic acid, tannic acid, &c. Some of the alkaloids contain C, H, N, and O; a few, however, contain no oxygen, as, for instance, the alkaloid of tobacco, **Nicotine**, $C_{10}H_{14}N_2$, and the alkaloid of hemlock, **Coniine**, $C_8H_{17}N$. These two alkaloids are volatile liquids. Other alkaloids are non-volatile, crystalline bodies. Alkaloids, as a rule, are not very soluble in water, more soluble in alcohol and ether, and generally easily soluble in dilute acids. A few of the most important alkaloids are:—

Strychnine, $C_{21}H_{22}N_2O_2$, found associated with another alkaloid, **brucine**, in the seeds of nux vomica.

Morphine, the active principle of *opium*, obtained from the dried milky juice of poppies.

Quinine, the valuable medicinal alkaloid of the *Peruvian bark*, from the Cinchona tree.

Caffeine or **Theine**, found in coffee, tea, and cocoa.

Ferments or **Enzymes** are a special group of organic compounds, which without changing themselves have the power to split up other organic substances. These processes of decomposition or splitting up are generally accompanied by production of heat, and are called processes of **fermentation.** Fermentation generally takes place in the presence of water, at certain favourable temperatures, and in the presence of fermentable and other substances. Fermentation may be produced by:—

1. *Unorganised ferments* or **enzymes**, or **chemical ferments**, like **diastase**, the peculiar chemical ferment of malt which produces malt sugar by the destruction of starch; **emulsion** in almonds, and **myrosin** in mustard seeds; **invertin**, the ferment changing cane sugar into invert sugar; **ptyalin**, found in saliva and acts like diastase on starches; **pepsin**, found in gastric juice and aiding in the digestion of proteins in making them soluble.

2. **Organised ferments**, which include a great number of minute organisms, as moulds, fungi, and bacteria, which by chemical changes essential to their growth act on organic substances, and cause various processes of *fermentation*, *decay*, and *putrefaction*.

The changes themselves, produced by the activity of such micro-organisms, are very complicated physiological processes, and are influenced by external conditions, as temperature, moisture, presence or absence of oxygen, &c. Many of the micro-organisms produce enzymes or chemical ferments during their growth, which then produce fermentations.

The assimilation of food materials by fungi and other micro-organisms is quite different from that of higher plants. As they possess no cells with chlorophyll, they cannot take up and utilise the carbonic acid of the air, but depend entirely for their supply of carbon on the decomposition of the surrounding bodies and substances with which they are in contact. Their wants of nitrogen are supplied by the albuminous compounds and amides and ammonia salts contained in the surrounding substances and to some extent from the nitrogen in the air.

To the activity of bacteria we must attribute the souring of wine and beer **(acetic fermentation)**; the souring of milk and ripening of cheese **(lactic and butyric fermentation)**; the change of ammonia salts into nitrates in soil **(nitrification)**; the decomposition of ammonia salts, nitrates, and other nitrogenous matters under production and loss of free nitrogen **(denitrification)**; the fermentation and partial digestion of cellulose (fibre) in the alimentary canal of herbivorous animals; and, finally, the decomposition or **putrefaction** of nitrogenous organic compounds under the evolution of foul-smelling products and gases, like ammonia, sulphureted hydrogen, carbonic acid gas, hydrogen, nitrogen, methane, &c. Such changes caused by putrefaction not only take place with dead animal or vegetable bodies, but also with any organic products containing nitrogenous matters, like milk, cheese, eggs, faceal matters, in cooked foods and vegetables, meat, fish, tinned meats, &c. Frequently very poisonous bodies, called **ptomaines**, resembling alkaloids, are produced as intermediate products in certain stages of putrefaction.

Putrefaction of organic substances and foods may be prevented in various ways:—

1. By preventing access of bacteria, by keeping the substances, which are free from germs, in hermetically sealed vessels.

2. By destroying all germs, both bacteria and their spores, by heating the substances to a temperature of 150° C. for at least one hour **(sterilisation).** Simple boiling of liquids would kill bacteria, but many of the spores, from which afterwards new bacteria are produced, may resist even prolonged boiling. As a rule, heating to boiling point, 100° C., will be sufficient to keep most common liquids; and a repeated boiling during a few consecutive days will completely

sterilise a liquid, without having to heat up to 150° C., which frequently destroys the flavour and gives a peculiar burnt taste (*Experiment* 111). The process of **pasteurisation**—heating the liquid (generally applied to milk or cream) for about 20 minutes to 70° C., followed by rapid cooling—will kill most of the objectionable bacteria without affecting taste or composition, but will only prevent fermentation for a limited period, as the spores have not been killed.

3. By keeping the foods at a very low temperature and thus checking the activity and development of bacteria, **cool storage** of butter, milk, meat, and fruits.

4. By **drying** or **desiccating** the foods, as in dried or desiccated fruits, sun-dried meat, or pemmican, as in the absence of moisture bacteria do not develop easily.

5. By the addition of chemical substances which destroy or check the growth of bacteria; but none of these substances can be recommended for the preservation of foods, as they all have poisonous properties and seriously interfere with digestion. Many compounds destroy bacteria completely, and they are generally called **disinfectants**; others, again, which only retard the development, are called **antiseptics**. A large number of disinfectants when used in dilute solutions are only like antiseptics.

The most powerful disinfectant is the extremely poisonous Mercuric chloride or corrosive sublimate, used in solution containing 1 part dissolved in 1,000 to 5,000 parts of water. But some spores—like, for instance, the spores of anthrax—require a 1 per cent. solution of mercuric chloride to be killed. Other disinfectants are:—Chlorine and Bromine gas, Sulphurous acid (burnt sulphur), Carbolic acid (Phenol) and Cresol, Formaldehyde or in a 40 per cent. solution called Formalin, Hydrogen peroxide, Zinc chloride (Burnett's fluid), Potassium permanganate (Condy's fluid). As antiseptics must be classed salicylic acid, boric acid and borax, salt, saltpetre, milk of lime, and alcohol.

Micro-organisms producing putrefaction, and living by obtaining their food materials from dead organic matters, and thus producing a decomposition of these substances, are called **saprophytic bacteria**. Other micro-organisms which gain entrance into the living bodies and feed on the substances of the living tissue, and are thus true parasites, produce frequently characteristic diseases, and are called **pathogenic bacteria**. How the diseases are produced is not quite clear, but in many cases the activity of the bacteria produces poisonous substances called **toxins**. The living body possesses various methods of defence against the attacks of the bacteria. Some are killed by the action of the blood; others, again, are attacked and devoured by the white corpuscles or phagocytes of the blood; and in other cases, again, the formation of peculiar substances, **antitoxins**, destroys or counteracts the effects of the toxin.

Moulds and *mildew* are higher forms of fungi, and are the causes of many common diseases of plants, as potato disease or blight, various forms of potato rot, smut of cereals, bunt, rust of wheat and oats, mildew on many plants, black spot of grape vines, rust of sugar-cane, ergot of rye, &c. For the destruction of moulds causing these diseases, substances called **fungicides** are used, which are generally plant poisons and are used in diluted solution so as not to injure higher plants. The most important fungicides are:—Copper sulphate or blue vitriol, iron sulphate or green vitriol, mercuric chloride, formaldehyde, potassium sulphide, flours of sulphur, hot water, &c.

APPENDIX TO SIXTEENTH LESSON.

Experiment 108.—Grate some potatoes, mix the pulp with a little water, and squeeze the juice out through a piece of linen cloth. The fibrous material of the cell walls will remain in the cloth; the contents of the cells, consisting of cell sap and starch grains, are forced through the cloth. Allow the milky liquid to stand until it becomes clear; decant the clear liquid from the white starch which has settled down. The clear liquid, when heated to boiling, will deposit a curdy, greyish-white precipitate of vegetable albumen. Collect this precipitate on a filter, dry it and burn it by heating on a piece of platinum foil or in a glass tube, when the peculiar disagreeable odour of burning nitrogenous substances—like horn, hair, wool—will be noticed, quite different from the smell produced when carbohydrates, starch, or sugar are burnt.

Experiment 109.—Soak some peas in water, and allow to stand for a few days until quite soft. Now bruise them in a mortar with a little water, and squeeze the thin paste obtained through a cloth. Allow the milky liquid to stand until clear, and pour clear liquid off from the deposited starch. Vegetable albumen may be again precipitated by boiling; the liquid is filtered, and the clear filtrate is treated with a few drops of acid, when another curdy, white precipitate of casein will be produced.

Experiment 110.—Moisten a little wheat flour with sufficient water to make a stiff dough; allow to stand for about half an hour, and wash the small ball of dough with water until the washing water does not show any more milkiness. All the starch grains are thus washed out, and a small lump of gluten remains. The gluten may be treated with hot alcohol (about 80 per cent.), and gliadin will be dissolved out, which may be precipitated from alcoholic solution by adding an excess of water.

Experiment 111.—Keep some fresh urine in an open bottle; after standing a few days, putrefaction will set in. At the same time, heat some of the fresh urine in a boiling flask, allow to boil for a few minutes, and when still boiling close the mouth of the flask with a good plug of cotton-wool; the urine, the flask, and the cotton-wool are thus after boiling a while completely sterilised, and the liquid may be kept in the flask for several days without putrefaction setting in, as the plug of cotton-wool prevents the access of any bacteria to the liquid.

QUESTIONS TO SIXTEENTH LESSON.

1. Enumerate the principal classes of organic compounds containing nitrogen.
2. What is the composition of Proteins?
3. How are the different proteids distinguished from each other?
4. Which parts of plants are rich and which are poorest in proteins?
5. What is the difference between Amides and albuminoids?
6. How do the amounts of amides and albuminoids fluctuate with the development of the plant?
7. Why are the seeds of leguminous plants quite as nutritious as flesh foods?
8. Which proteins are the nutritious constituents of the wheat grain?
9. What are alkaloids?
10. What is the difference between organised and unorganised ferments?
11. Enumerate a few processes of fermentation in which bacteria play an important part?
12. By what factors will fermentation be influenced?
13. How is it that the eating of bad tinned meats, stale corn-beef, &c., may cause serious illness and even death?
14. What is the difference between sterilisation and pasteurisation?
15. How can foodstuffs be preserved?
16. Which are the most important disinfectants?
17. How does the living body defend itself against the attacks of bacteria?
18. What is the cause of black spot on grape vines, rust of wheat, and similar diseases?

VALUE OF PEANUTS AS A FOOD.

While thousands of people consume their pack of peanuts, little is known of this palatable and companionable nut—companionable, because there is such satisfaction in having them near at hand, they help to pass away the time—people eat and continue to eat until every nut is gone, totally unaware that they are consuming the most nutritious food that can be obtained. The little peanut, that only a few years ago was considered by the physicians as unfit to put into the stomach, is now the basis of food products of one of the largest sanitariums in the country—analysis proves it to contain three times the nutriment of beef—hence, as it becomes better known and its value realised, it enters the bill of fare in the shape of peanut butter, salted peanuts, soup, cakes, &c. Many vegetarians through the country use no other bread lubricant than peanut butter, which has been prepared from the roasted nut.—"American Nut Journal."

Entomology.

RABBITS AND ANTS.

We have lately heard a great deal about the red, meat-eating ant of Natal, and it has been proposed by a South African journalist to interest Lord Avebury (Sir John Lubbock), who is a great authority on the subject of ants, in their introduction into Australia. These African meat-eating ants are said to get into the rabbit burrows and devour the new-born rabbits. They will not touch animals which are not born naked—*i.e.*, furred young animals are immune from their attacks. In Queensland we have plenty of flesh-eating ants. Mr. W. Froggatt, F.L.S., Government Entomologist of New South Wales, in an article on this subject published in the "Agricultural Gazette" of New South Wales, says:—"I would point out that Australia has a wonderfully rich ant fauna, for there are over 500 distinct species of ants described from Australia, and there are many more undetermined species yet to be examined and named. The dry interior, where Brer Rabbit flourishes to such a wondrous extent, is infested with many species, and one which forms large ant beds containing countless swarms of savage little creatures is popularly known as the "meat ant," and woe betide any weak, injured, or sick creature that falls on the ground in the vicinity of one of these ant nests; it will be literally eaten alive if no one comes to its assistance. I have seen them swarming over the remains of dead rabbits, and carrying away the bits of flesh piecemeal, but it does not trouble the living ones."

Mr. Froggatt goes on to quote a letter from a resident of Thursday Island on "Red Rabbit-eating Ants," who says that the red ant of Natal appears to be identical with that of North Queensland. It is a small species, the size of the little brown ant, which infest the houses and larders. The sting of this ant is something similar to the point of a red-hot needle being thrust into one. Like the South African ant, it attacks any young animal or bird, such as young chicks coming out of the shell, and the sting is so fierce that it would take the ants no length of time to destroy a whole clutch. The correspondent says, in conclusion, that he does not think this ant would thrive in cold climates, and that presumably, therefore, it would be a failure if it were imported.

Mr. Froggatt says that this Thursday Island ant seems quite capable of settling the rabbit question if its sphere of usefulness were extended to the mainland; but, nevertheless, he thinks it would be advisable to take all precautions to keep it in its island home.

It appears that in Guatemala there is an ant called "Kelep" by the natives, which, it was claimed by them, devoured the cotton-boll weevil so efficiently that it was no pest to the growers wherever these ants were established.

The little snout-beetle had been introduced from its native home in Mexico into the United States, and spread over the greater part of the cotton fields of Texas and Louisiana. Mr. O. F. Cook, of the Washington Department of Agriculture, who discovered the "Kelep" while engaged on botanical work in Central America, seized with the parasite theory, immediately set to work to collect and transport colonies of these ants into the infested States, and breed them in the laboratory at Victoria, Texas. Since the introduction of these ants, some 4,000 in number, some persons in the State applied for an injunction against the Department of Agriculture to stop them from distributing such an insect broadcast in the country. Mr. Froggatt has heard nothing about them

since then. In conclusion, he says:—"The question of introducing ants to kill weevils on cotton fields, however (even if successful), is a very different matter when we talk of spreading them over the vast area inhabited by the rabbit in Australia at the present time; even if they could be collected in sufficient numbers to send them in a continuous stream for a year or two, how long would it take to be effective, even if this ant attended only to rabbits, and left all other insects, animals, and birds alone? Then our bull-dog ants and meat or mound ants would have to be reckoned with. (To these Mr. Froggatt might have added our huge soldier ants, the ferocious jumper, and the stinging green head, which are so numerous in Queensland.) They are in possession; they burrow into the ground, and would probably take a hand in destroying any interloper into their domains. The balance of power that would be upset by such an assisted emigrant, if, in spite of all difficulties, it did establish itself, might be quite as serious as the rabbit; for, when the last rabbit had vanished, the whole of Australia would be honeycombed with the nests of an ant, described in such terms by the Government Entomologist of the Transvaal that life in the Australian back blocks would be hopeless, and the settler could not retaliate by eating the ants.

The rabbit is bad enough, but the ant would be worse. It was at one time proposed to introduce the mongoose into Queensland to destroy snakes and cane rats. Mr. Froggatt tells us what happened owing to the introduction of this little animal into Jamaica for the purpose of destroying the rat. The mongoose soon settled up the rats, but when these were gone the mongoose still had to eat, and all the ground animals, birds, and reptiles followed in the wake of the vanished rats. Still the mongoose, without any natural enemies, increased, and the food supply was gone; then poultry and other domestic animals came into the bill of fare of the hungry mongoose. The inhabitants had to kill the mongoose. Just then the scrub tick took a hand in the game, and the mongoose was doomed. The few survivors of the native fauna began to show up, and, according to latest reports to hand, things were coming back to normal conditions.

Science.

THE DIVINING ROD.

That the presence of subterranean water can be detected by the use of the divining rod has been so decisively proved that incredulity in the efficacy of the rod when in suitable hands can no longer be regarded as anything but obstinacy and ignorance. Boring for water on some stations in Queensland is now only undertaken after the water-finder has examined the country and has pointed out the locations where water would be infallibly obtained. It is still doubted, however, by many who put the fullest faith in the diviner's powers that he can even indicate the depth at which the water lies, yet there are some men in Queensland whose prognostications in this direction have been proved correct. It is not given to all men to successfully discover water by this means. We have seen four experimenters at work, and the rod would only respond in the case of two of them. It is said that it was by the use of the divining rod that Moses obtained the water for the Children of Israel in the desert. However that may be, there is certainly neither miracle-working, witchcraft, nor African Obeah woman in the business.

What is it, then, that causes the rod to work? By the way, the material of the rod has little to do with success. Some use a forked stick of hazel, peach, willow, or of any bush tree; others use a copper wire bent to a circle; some a mere thin iron bar. No one has yet absolutely shown the connecting link between underground water and the rod and man. It can, however, be conjectured that the subtle, hidden influence lies in gases, generated by the water passing through chemical and mineral substances, escaping to the surface. In Marconi's wireless telegraphy, the wires at the receiving station must be exactly attuned to those at the sending station. If these are not in harmony, a message cannot be properly recived. May it be something of this nature which influences the rod? Either the gas or electricity from the water veins possibly acts on the nerves of the water-finder.

A peculiarity of the rod is that it is only affected by water veins and not by water in pipes. If the diviner stands over a closed water pipe, the rod will not act, but, open the pipe and let the water run, and the rod will at once indicate its presence.

Water-finders have frequently been set down as frauds, because, although they have pointed out localities in which water existed, bores have been put down without striking water. This is frequently to be accounted for by the tortuous course of the subterranean stream. Imagine a stream like the Brisbane River, lying 300 feet below the surface of the ground. It is quite possible to conceive twenty bores being put down without striking water, because all of them were sunk in the many bends of the river. It is well worth studying the articles in the London "Times" on this subject, written by Professor Wertheimer. Extracts from these articles are published by the "Pastoralists' Review," and, considering the fact that success has invariably attended the work of the water-finders in Queensland, it will come as a surprise to read that another writer in the "Times" denounces water-finders as humbugs, a denunciation which can be amply disproved by the results of experiments in water-finding in this State.

ARE WATER-FINDERS HUMBUGS?

The apparent success achieved by water-finders of late in Western Queensland lends special interest to articles in the "Times" of 27th September, giving an account and criticism of experiments made in England with water-finders by Professor Wertheimer, Principal of the Merchant Venturers' Technical College, Bristol. These experiments were the outcome of a correspondence on the subject in the "Times" during the winter of 1904-5, and were undertaken by the professor in a "quite neutral attitude of mind," "for," he writes, "while I should have been glad if the results of the experiments had shown that there was a new unknown external force, I was, on the other hand, fully aware of the possibility of persons misleading themselves in such matters, and mistaking subjective for objective effects." The professor carried out a series of experiments with some half-dozen "dowsers" of high repute, whose honesty he does not question, and his conclusion is as follows:—

In so far as these experiments have gone, I am inclined to believe that the motion of the dowser's rod and the sensations which he experiences are not due to any cause outside himself. The experiments do not answer definitely the question whether or not dowsers have the power to find water; but I think they show (*a*) that experienced dowsers did not give the same indication in the same place, and (*b*) that the movements of their rods were, in several of the experiments described, due purely to subjective causes.

These conclusions, as the "Times" says, "are not very conclusive. They leave undetermined the question whether 'dowsers' have or have not any exceptional power of finding water. They affirm that in several cases, but not, it would seem, in all, the movements of the 'dowsers'' rods were due purely

to subjective causes. Incidentally, however, the experiments would seem, as might perhaps have been expected, to have eliminated electricity as an agency contributing in any way to the 'dowser's' success, and they do undoubtedly show that 'dowsers' of equal experience and repute do not give the same indications in the same place, even in a comparatively narrow area within which they are told that water does actually exist, though they are not told exactly where it is to be found."

SCIENCE AND PRACTICAL MEN AT ODDS.

The "Times" writer, who is more downright in his criticisms than the professor, goes on to more than suggest that water-finders are humbugs, and not unjustly remarks that "Professor Wertheimer's investigations point to the conclusion that the 'dowser' is not, as a rule, any more successful than if he had made a mere guess at the result." This conclusion, however, is against the experience of practical men, such as the Western Queensland pastoralists, and we should like to have the views of one of the Messrs. Ramsay, of Oondooroo, upon the scientific verdict. They are not only shrewd, practical men, but protected by a good education and a scientific turn of mind against being easily deceived on such a subject. We find the same difference between the scientific conclusion and the practical one on the question of telegony. Most pastoralists believe that the influence of a sire extends to the subsequent progeny of the dam, and yet no case has ever yet been scientifically proved, and the extensive experiments conducted some years ago by a Scotch professor failed to yield the slightest evidence that a previous sire affects subsequent progeny. Of course, practical men will continue to say that they "know, and scientific evidence can be hanged." But that is not a really satisfactory reply. If water-finding is a mysterious power, and telegony a fact, it should not be difficult to furnish evidence of same under conditions which science would accept. But the essential point of scientific conclusion is that it should leave no loophole of possible escape in the circumstances for any other conclusion than that arrived at.

WATER-FINDING EXPERIMENTS.

Space fails us to give an account of the experiments. But a few may be mentioned. In one instance a water-finder was invited to find three wells and a spring within an area of 50 yards square. He never went within 12 feet of the spring, although he passed over its source several times, and, as to the wells, he drew so many curved lines to indicate underground water channels that the bare doctrine of chances might account for some of them hitting the mark. He was then invited to stand over a water main, in which a large current was flowing, and to determine the times at which this current was stopped by prearrangement. In this he only succeeded in four cases out of ten, an average exceeded by several agricultural college students, who relied on guess-work. In another case a "dowser" was asked to find a known underground channel, consisting of a tiled drain running with an abundant flow of water. He passed over the drain six times. On three occasions his rod gave indications, and on three others it did not. Again, three "dowsers" were required to indicate the position of the springs feeding a well in a kitchen some 21 feet by 16 feet. The course of springs indicated by two of them did not lead near the well, but the third, having been told the position of the well, was able to indicate the supposed position of the channel leading to it. On the whole, therefore, the experiments yielded an unsatisfactory result.

General Notes.

POTTING PLANTS.

New pots should be thoroughly soaked and dried before being used, and old ones must be well washed. Before putting in the soil, provide drainage by putting a piece of broken pot over the hole in the bottom. Then put in a number of smaller pieces. To ensure good drainage, place some fibrous turf over the potsherds. This will keep the finer particles of soil from working downward and stopping the free course of the water. The pot soil should be a rich light compost, nicely damp. If wetted too much, some composts will knead together like dough, and will crack and shrivel. If too dry, the delicate root hairs are injured. Do not pot soft-wooded plants too firmly, but hard-wooded ones with wiry roots require firm potting. The old plan of standing pots in saucers is a mistaken one, except in the case of semi-aquatic plants. The roots require free access of air to the hole at the bottom.

RAINFALL.

To estimate the volume of rainfall, the depth of inches of rainfall multiplied by 22,623 will equal the gallons per acre. Thus, 2 inches of rainfall gives 45,246 gallons per acre; 5 inches equals 113,115 gallons.

INK FOR ZINC LABELS.

Take 1 part sal ammoniac, 1 part verdigris, ½-part lamp black, and 10 parts water; mix thoroughly together, and keep in a glass-stoppered bottle. Shake before using; write with a J pen. Another useful ink is made by dissolving half a teaspoonful of sulphate of copper in a small penny writing ink bottle.

HOW TO DISSOLVE BONES.

Cover the bottom of a tub or hogshead with 6 inches of dry soil. On this place the same depth of bones, and cover entirely with wood ashes. Repeat these layers till the vessel is filled. After exposure to the weather during the summer and the winter, the whole mass can be readily reduced to powder, and thus form a valuable manure for digging into the ground in spring.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

COFFEE-GROWING.

S. LELAND, Toowoomba.—You could not grow coffee on the Darling Downs. Even at Kuranda, near Cairns, frosts have severely injured the coffee-trees. The plant does well on some sheltered parts of the Blackall Range and on the Buderim Mountain. The tree begins to bear in the third year from planting out. From blossom till crop there is a lapse of about seven months. The ripe berry is called cherry. A tree will yield from 2 lb. to 3 lb. of clean coffee, but 1 lb. per tree is about an average, and an average crop runs to from 7 cwt. to 12 cwt. per acre.

BANANA FLOUR.

J. C. Y., Cairns.—If you read the article in this issue on Banana Flour and its prospect, you will probably come to the conclusion that there is nothing to hope for in the way of establishing a profitable market for the article.

DEMAND FOR POULTRY.

The most watchful medical observer of the ways of microbes has never been able to get up a scare about the danger of consuming eggs and poultry. Almost every other substantial food available to us—meat, milk, butter, oysters, and so on—have come under the gravest suspicion. The worst charge brought against eggs is that they have a tendency to cause biliousness. Yet even that is happily disputed—and by a doctor. Sir James Crichton Browne declared the other day that we could each of us eat with profit from six to a dozen eggs a day. Such a course of them might produce a little biliousness at first, but, persevered with, they actually became, by their great nourishing power, a preventive of biliousness as well as of many other ills. Mr. E. Brown, the secretary of the National Poultry Organisation Society, was sent over to the United States and Canada a few months ago to gather new ideas with a view to the extension of the poultry industry in this country. In an elaborate and valuable report which he has just written as the result of this tour, he notes that there is a "rapidly growing demand" for eggs and poultry in England, and he has come to the conclusion that, while there can be no effective competition with foreign and colonial exporters in the market here for medium quality goods, England might easily extend its footing in the highest section of the trade. Of poultry alone £524,010 worth was imported in the first seven of the present year. The imports from the United States represented more than 45 per cent. of the total. Queensland, by the way, has shown more than once that it can land poultry in London of distinctly higher quality than the average that America can send, and much above the quality of the Russian supplies. Canada's trade with England has declined, owing to increased home consumption. The Dominion Government spent large sums of money in the encouragement of the poultry industry. It has shown great improvement within the last six years, and the first result has been to send up local market values to a point which leaves little encouragement to exportation. The value of the eggs and poultry produced in Canada last year is said by Mr. Brown to have been not far short of £5,000,000. The total for the industry in the United States is estimated at £100,000,000. That gives an idea of the possibilities of the trade. Queensland poultry-breeders should secure copies of Mr. Brown's report. It contains some very useful information on grading, scientific feeding of fowls, and other points.—"Courier."

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

Stations.	1905.		1906.										
	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
North.													
Bowen	3·91	0·04	12·84	8·73	6·29	0·78	6·34	0·69	0·04	0·36	3·41	1·76	0·99
Cairns	1·72	0·53	7·00	16·87	16·05	5·20	4·04	3·44	2·28	1·79	1·57	0·56	13·44
Geraldton	5·44	1·14	15·61	37·67	19·67	11·51	7·93	16·05	5·73	6·65	4·26	2·28	21·08
Herberton	1·69	0·51	15·20	3·73	4·67	1·25	1·38	1·04	0·59	0·55	0·38	0·30	5·16
Hughenden	0·07	0·14	6·11	3·93	8·47	0·12	Nil	Nil	Nil	Nil	0·92	0·61	0·51
Kamerunga	1·05	0·33	7·25	13·76	14·93	4·94	4·13	3·55	2·49	2·03	2·56	0·72	10·00
Longreach	0·77	0·17	3·99	8·61	12·25	Nil	0·22	Nil	0·11	Nil	4·11	2·16	0·66
Lucinda	2·03	0·95	10·13	49·97	25·88	10·12	3·77	3·02	0·40	...	Nil	1·85	6·60
Mackay	2·45	0·70	13·58	9·88	16 57	2·87	11·87	3·85	0·68	0·93	4·35	2·63	1·80
Rockhampton	1·05	4·77	4·24	15·31	8·26	Nil	5·27	1·12	Nil	2·61	3·80	1·07	0·46
Townsville	0·19	Nil	10·05	17·31	4·28	0·38	1·80	0·30	Nil	0·46	3·25	1·45	7·74
South.													
Barcaldine	1·49	1·30	4·00	7·07	13·84	Nil	1·70	0·19	0·10	Nil	2·88	2·92	1·33
Beenleigh	1·76	3·77	4·96	15·11	9·34	0·04	3·57	1·47	0·16	2·94	3·47	2·94	1·75
Biggenden	1·14	11·66	2·27	8·24	4·61	0·45	5·77	1·42	0·48	3·02	5·07	1·19	3·09
Blackall	1·45	0·83	5·13	11·14	11·99	Nil	1·75	0·22	0·48	0·02	4·70	5·86	1·37
Brisbane	3·63	8·21	4·16	12·71	4·85	0·45	3·23	1·38	0·22	4·21	3·48	3·81	1·07
Bundaberg	0·95	6·74	6·92	9·92	1·90	1·17	8·44	2·01	0·03	1·86	10·90	1·57	0·97
Caboolture	2·88	6·72	8·11	12·73	6·46	0·49	4·53	0·85	0·29	3·02	4·77	4·73	4·26
Charleville	0·68	0·12	1·29	10·66	3·15	0·07	...	0·13	2·34	0·35	4·99	2·66	1·30
Dalby	1·60	5·67	4·15	4·43	5·15	1·81	0·68	0·87	1·58	2·78	2·65	2·96	2·12
Emerald	4·41	0·80	6·12	7·81	5·22	0·08	2·12	0·17	Nil	1·62	4·47	1·55	2·32
Esk	3·65	5·98	5·49	6·79	9·04	1·74	3·25	0·77	0·38	4·51	4·14	2·90	2·45
Gatton College ...	3·59	4·73	3·75	5·33	9·43	1·40	1·90	0·60	0·41	3·73	3·54	2·25	2·01
Gayndah	1·93	5·58	2·81	9·65	5·86	0·51	5·10	0·48	0·22	2·34	5·14	2·25	4·25
Gindie	3·79	Nil	1·92	9·15	5·92	Nil	2·32	0·05	Nil	1·46	4·57	3·20	2·95
Goondiwindi	1·51	2·72	1·08	2·60	2·19	0·37	2·80	0·98	0·49	4·35	3·33	2·36	2·32
Gympie	1·44	5·03	6·07	7·38	5·58	0·45	6·88	2·26	0·52	3·19	3·97	3·03	4·12
Ipswich	3·32	3·64	5·30	7·22	3·87	0·12	1·67	0·25	0·17	2·59	2·94	2·60	0·71
Laidley	3·59	3·73	3·29	5·63	6·73	0·35	2·83	0·49	0·50	3·26	3·19	2·87	1·78
Maryborough	0·70	4·03	4·46	8·34	6·77	1·08	4·85	2·55	0·15	2·31	6·48	1·22	2·49
Nambour	0·85	5·37	7·01	16·50	9·35	1·13	6·20	3·68	0·61	4·52	8·94	4·89	3·40
Nerang	2·21	5·14	5·01	13·68	10·04	0·87	10·32	1·98	0·12	3·56	6·42	8·26	2·75
Roma	2·15	2·62	2·18	12·95	3·94	Nil	1·09	1·08	1·65	1·47	4·43	2·37	1·32
Stanthorpe	1·94	4·43	6·06	2·76	3·18	2·00	0·77	0·45	1·44	3·37	4·29	2·90	2·49
Tambo	1·57	0·39	5·09	9·05	10·63	Nil	0·66	0·05	0·67	0·07	5·17	2·85	1·23
Taroom	1·11	2·52	1·86	13·73	6·02	0·23	1·04	0·81	0·60	2·30	4·26	1·70	1·35
Tewantin	1·28	6·64	12·07	18·59	7·57	2·27	4·61	5·68	0·39	4·25	6·37	4·38	2·73
Texas	0·94	4·54	3·41	2·11	1·94	1·89	1·57	0·75	0·90	3·22	2·77	3·42	2·23
Toowoomba	2·09	3·20	6·17	6·58	8·87	2·07	2·65	0·85	1·81	3·63	4·55	2·76	2·65
Warwick	2·16	3·98	2·09	2·21	6·27	0·37	0·77	0·57	1·16	3·85	3·13	2·47	2·99
Westbrook	3·62	2·39	5·00	4·01	5·12	0·93	0·50	0·55	1·67	2·80	3·34	3·41	*

* Return not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	DECEMBER. Prices.
Apples, Eating, per packer, Hobart	12s. to 16s.
Apples, Cooking, per packer, Hobart	7s. 6d. to 12s.
Apples, American, per packer	...
Apples, Cooking, per packer	...
Apples, Local, per packer	8s. to 10s. 6d.
Apricots, quarter-case	...
Bananas, Local, per bunch	2s. to 3s.
Bananas, per case	6s. to 7s.
Bananas, Fiji, per bunch	2s. 6d. to 6s.
Bananas, Fiji, per case	11s. 6d. to 12s. 6d.
Cherries, quarter-case	2s. 6d. to 3s. 6d.
Comquats, case	...
Lemons, per case, Local	5s. to 7s.
Lemons, per quarter-case, Imported	from 3s.
Mandarins	3s. 3d. to 5s. 6d.
Mangoes, per case	2s. 6d. to 3s. 6d.
Oranges, per packer, Imported	...
Oranges, Local, per packer	5s. 6d. to 6s.
Papaw Apples, per case	5s.
Passion Fruit, gin case	1s. 6d. to 2s. 3d.
Peaches, per case	1s. 6d. to 3s. 6d.
Peanuts, per lb.	2½d.
Pears, Imported, per quarter-case	...
Pineapples (rough leaf), per dozen	2s. 6d. to 5s. 6d.
Pineapples (smooth leaf), per dozen	4s. 6d. to 8s.
Plums, Imported, quarter-case	...
Plums, Local, quarter-case	...
Quinces, Imported, per case	...
Rockmelons, per dozen	1s. 9d. to 2s. 6d.
Strawberries, per tray	1s. to 2s. 6d.
Tomatoes, quarter-case	9d. to 1s. 3d.
Watermelons, per dozen	3s. 6d. to 6s.
Cape Gooseberries, per quart	3½d. to 5d.
SOUTHERN FRUIT MARKET.	
Apples, per case	8s. to 14s.
„ Tasmanian, per case	9s. to 12s.
„ American, per case	to 16s.
Cherries, quarter-case	8s. to 9s.
Gooseberries, quarter-case	3s. to 3s. 6d.
Strawberries, per dozen punnets	4s. to 6s. 6d.
Bananas, Queensland, per case	11s. to 12s.
„ „ per bunch	2s. 6d. to 4s. 6d.
„ Fiji, per case	14s. to 14s. 6d.
„ „ per bunch	3s. to 8s.
Chillies, per bushel	6s.
Lemons, per gin case	4s.
„ Medium to good, per gin case	5s. to 7s. 6d.
„ Extra choice „ „	8s. to 9s.
Mandarins, Emperor, choice, case	9s. to 10s.
Oranges, medium to extra choice, per case	12s. to 13s.
„ common, per case	8s. to 9s.
Pineapples, Queensland, common, case	9s. to 11s.
„ „ choice „	10s. to 12s.
„ „ small „	7s.
Rockmelons, case	...
Tomatoes, Queensland, choice, per quarter case	3s. to 3s. 6d.
„ „ green „	2s. 6s. to 3s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR DECEMBER.

Article.		DECEMBER. Prices.
Bacon (Pineapple)	lb.	8d. to 9½d.
Barley (Malting)	...	...
Bran	ton	£3 15s. to £4 15s.
Butter, Factory	lb.	9½d.
Chaff, Mixed	ton	£3 to £4
Chaff, Oaten	„	£3 17s. 6d. to £4 7s. 6d.
Chaff, Lucerne	„	£3 to £3 6s.
Chaff, Wheaten	„	£2 10s.
Cheese	lb.	5½d. to 7d.
Flour	ton	...
Hay, Oaten	„	£4 17s. 6d. to £5 5s.
Hay, Lucerne	„	£1 15s. to £2 15s.
Honey	lb.	1½d. to 1¾d.
Maize	bush.	2s. 2d. to 2s. 5d.
Oats	„	...
Pollard	ton	£4 15s.
Potatoes	„	£2 10s. to £4 10s.
Potatoes (Sweet)	„	...
Pumpkins	„	...
Wheat, Milling	bush.	...
Wheat, Chick	„	2s. 6d. to 3s. 6d.
Onions	ton	£5 10s. to £7
Hams	lb.	11d. to 1s.
Eggs	doz.	6d. to 9d.
Fowls	pair	2s. 6d. to 3s. 7½d.
Geese	„	5s. 7d. to 7s.
Ducks, English	„	3s. to 3s. 4½d.
Ducks, Muscovy	„	3s. 11d. to 5s.
Turkeys, Hens	„	6s. 3d. to 8s. 3d.
Turkeys, Gobblers	„	6s. 11d. to 18s. 6d.

ENOGGERA SALEYARDS.

Animal.	NOVEMBER. Prices.
Bullocks	£9 17s. 6d. to £11 17s. 6d.
„ (Extra)	£12 10s. to £14 10s.
Cows	£8 to £9 17s. 6d.
Merino Wethers (early shorn)	23s. 3d.
„ Ewes (woolly)	20s.
C.B. Wethers	20s. 9d.
„ Ewes	19s.
Lambs	16s. 9d.
Pigs	Nil.

Orchard Notes for February.

By ALBERT H. BENSON.

In bearing deciduous orchards, the chief work of the month will be the gathering and marketing of the fruit. This work requires to be carried out in a much better and more systematic manner than is usually the case, as a great deal of our fruit is badly handled, badly graded and packed, and is sent to market in a very unattractive manner. Good fruit always pays for careful handling and neat packing. Use clean new cases, grade the fruit for quality and size, and carefully examine it for fruit fly, scale insects, or codlin moth. All infected fruit should be destroyed by boiling, and be then fed to pigs or poultry, as its presence in the case is apt to condemn the whole when same is examined by the inspectors under the Diseases in Plants Act.

When codlin moth is present, the bandages should be examined every week, and all larvæ found therein destroyed, and all moth-infested fruit should be gathered and destroyed. If this method of treatment is carefully carried out throughout the season, there will be no great difficulty in keeping this pest in check, as it is not generally established, but is practically confined to the Stanthorpe district and two or three other parts of the Downs.

The fruit fly must be systematically fought by gathering and destroying all infected fruit. This is of special importance in the Stanthorpe district, where it will do considerable injury to the later fruits unless every effort is made to stamp it out as soon as it makes its appearance. Fruit imported into this district from other parts of the State should be carefully examined, and, if found infected, should be at once destroyed, as there is no surer way of giving the pest a good start than by the introduction of infected fruit.

Young deciduous trees should receive their summer pruning where necessary. This pruning consists in the shortening back of long straggling growth, and the thinning out of superfluous wood. Its object is to keep the trees strong and symmetrical, and cause the development of fruit spurs along the main branches. The manner in which the pruning is carried out and the result of such treatment in the past can be noted by a visit to the State orchards at Hermitage or Westbrook. Such a visit will well repay any fruit-grower the trouble and expense of the journey to these farms, and will show better than any writing how the work should be carried out.

The budding of deciduous trees can be done now, the only elements necessary to success being that the bark runs freely, that the buds are plump and well developed, and are tied firmly into their places.

In the coastal districts the planting of pines and bananas may be continued if desired, but earlier planting is preferable, especially in the Southern parts of the State. Tropical fruits, such as mangoes, should be planted during the month, choosing dull moist days for the purpose. Mangoes can also be budded or grafted either by the method of plate-budding described by Mr. Knight in the July number of the Journal, Vol. VII., p. 41, and Vol. VII., p. 256 (September), or by means of the saddle graft as described in the January number of the Journal for 1899.

All citrus fruits can be budded, taking care to use plump, well-developed buds, and to see that the bark runs freely.

All young trees in the nursery should be kept well cultivated and free from weeds. They should be trained to a single stem, and staked where necessary. Seedling citrus stalks can be set out in the nursery row during seasonable weather.

There is usually a heavy growth of weeds and summer grass in the orchard during the month, so that every opportunity should be taken to keep them in check by means of the harrow or cultivator during dry weather, as, if this is neglected, they are apt to get out of hand during a wet spell. In the drier parts of the State the orchard should be kept well cultivated, and, where water is available for irrigation, citrus trees should receive a good soaking during the month, taking care to give the land a thorough cultivation as soon after the irrigation as it will stand working, as this tends to prevent the formation of a crust and to retain the moisture in the soil. In the Southern coastal districts mangoes and the main crop of pines will be ripening towards the end of the month, so that in the case of the former every precaution should be taken to prevent their destruction by fruit fly by the gathering and boiling of all fly-infected fruit of all kinds. The destruction of scale insects should be continued by either spraying or cyaniding; and where leaf-eating insects are troublesome the same can easily be kept in check by spraying with arsenical washes, as recommended in the October number of the Journal for 1900.

Where it is proposed to plant orchards on new scrub land this is a good time to fell the scrub, letting it lie till late in the autumn or early winter, when it can be burnt off during dry bright weather. The clearing of forest land can also be continued, the land as stumped being sown with corn preparatory to its being planted with trees the following winter, as the working that the corn receives is a good preparation of the land for fruit.

Farm and Garden Notes for February.

Field.—During this month the land intended for potatoes should be ready for planting. Plant only small potatoes whole. If large potatoes are cut into setts, there is risk of their rotting, as the usual wet weather may be expected with a hot muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep, rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, Kafir corn, imphee, sorghum, and vetches may be sown, but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop sow Swede turnips and mangoldwurtzels.

Kitchen Garden.—Make preparation for good crops of vegetables for the early winter by ploughing or digging all unoccupied ground, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, prepared as follows:—

Spread a layer of black soil on the ground; dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes and plaster (gypsum), so that the compound shall contain the following proportions:—

Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel; plaster, 1½ bushels. Mix thoroughly and a little before planting, moisten the heap with water, or better still with urine; cover with old mats and let it lie till needed.

Most market gardeners will have cabbage and cauliflowers ready for transplanting. Do this during the month. Read the article in this issue on growing cauliflowers in the Brisbane district, in which it is recommended that the middle of January (now past) and the middle of March are the best times

to sow the seed. Sow "Eclipse" or other large Asiatic variety. If the aphis appears, spray the plants with tobacco solution.

Sow French beans, butter beans, beet, carrot, turnip, radish, cabbages, cauliflowers, cress, peas. Should the weather be dry after January rains, give the plants a good soaking of water. Gather all fruit of cucumber, melon, French beans, and tomatoes, to ensure the continued productiveness of the vines.

Flower Garden.—Thin out and tie up dahlias. Keep the weeds down, never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, asters, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemums, verbenas, petunias, penstamons, &c. Dianthus sown now and planted out in March will bloom during the whole year if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep. On the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should only be covered with fine soil to a depth equal to their own size—for instance, a sweet pea is about one-eighth of an inch in diameter; therefore cover it with one-eighth of an inch of soil.

GROWING CAULIFLOWERS IN THE BRISBANE DISTRICT.

The best time for sowing seed is between the middle of January and the middle of March, as cauliflowers occupy the ground from five to six months, and should be in flower in the coldest weather. The best kind to sow is "Eclipse" or other large Asiatic variety. Seed beds should be cultivated to a depth of not less than 12 inches, being well manured and watered previous to sowing. The best locality for a seed bed is under a fence with an easterly or westerly aspect, so that the sun is not on the bed much more than half the day. Mix the seed with fine ashes, and then scatter over the face of the bed, raking in to a depth of about an inch. Water the bed at once, and cover it with a light layer of fine grass or hay; repeat the watering about every second day, and, when the leaves begin to form, the grass covering may be removed. Cauliflowers do better in virgin soil than elsewhere, provided the ground is well pulverised before to a depth of about 15 inches, and all grass and weeds eradicated. If the soil is poor, a dressing of farmyard manure is necessary beforehand, which should be well dug in. Plants when large enough to remove from the seed bed should be spaced about 3 feet each way, and if at all possible not more than two rows should be grown together, otherwise they get too much shade in the winter months. Frequent watering in dry weather is an essential element to the growth of good cauliflowers, but the day following each watering the surface of the ground must be broken up to admit air. After the plants commence to grow freely in the rows, the best manure is found to be No. 1 Fertiliser, which can be obtained at a moderate price from any meatworks. Put a fair sprinkling of this round each plant, but not too close to the stem, then fork in to a depth of 3 or 4 inches, taking care not to disturb the roots. If the plants do not grow freely, a second dressing of fertiliser should be given. Grubs must be searched for daily early in the morning, as even with the greatest care the heart of the young plant will be occasionally found destroyed, and in such case throw it away and put another in. A reserve supply of plants should be set out for that purpose, and can be removed without losing a leaf, if a good clod of soil is taken with them and they are watered at once.

Watch for the tracks of the Vaginula Slug, so destructive to cabbages and cauliflowers. A ring of tobacco dust round each plant or even round the bed is a certain safeguard.

Agriculture.

GRAIN HARVEST AT THE STATE FARM—ROMA.

The following report, dated 5th December, 1906, was furnished to the Under Secretary, Department of Agriculture and Stock, by Mr. R. E. Soutter, manager of the lately established State farm at Bungeworgorai, Roma district:—

Sowing was commenced on 27th April, and completed by the end of May. All crops were above ground by the second week in June.

Up to the middle of August, the growth of them, on the whole, was slow.

Rust, which has proved so disastrous all over the district, was first noticed on the farm on the 28th August.

Ripening was considerably delayed, through the continued wet weather in the latter part of the season. First crop was fit to harvest about the last week in October.

RESULTS.

Series A.

This comprises 23 quarter-acre blocks, sown at rate of ¼ bushel to acre, accomplished by stopping up every other tube in the drill. The wheat came up very unevenly; some not until three weeks after first made its appearance; consequence ripened unevenly. Had it all come through in the first place, the effects of the rust would not have been nearly so bad, as in the early patches the grain was only slightly pinched.

The soil in the blocks is splendid, but the situation is not a desirable one for a season like this, as it receives all the drainage from the vineyard ridge.

Hermitage No. 1.—Earing, Sept., 1st week. Harvested, Nov. Yield, 12·2 bush. per acre. This block was sown with seed grown in the Maranoa. Rusty, grain pinched, did not fall down. Nice clean straw. Good stooler.

Hermitage No. 1.—Earing, Sept., 1st week. Harvested, Nov. Yield, 13·8 bush. This block contained at least five varieties of wheat, so that the grain garnered is only useful for feed. Good grain in forward places, rest pinched.

Hermitage No. 2.—Earing, Sept., 1st week. Harvested, Nov. Yield, 11·06 bush. Nice clean straw, a little open in glumes, strips well and thrashes well. Grain pinched, excepting in forward places, stooled fairly well.

Hermitage No. 3.—Earing, Sept., 1st week. Harvested, Nov. Yield, 11·8 bush. Similar to preceding wheat, stooled fairly well.

Bobs.—Earing, Sept., 1st week. Good stooler. Rusted very badly; was cut with binder October 15th.

Cumberland.—Earing, Sept., 2nd week. Harvested, Nov. Yield, 8·8 bush. Fine straw, medium height. Good to strip and thrash; susceptible to smut (loose). Good grain forward places. Rusty.

J. Brown.—Earing, Sept., 2nd week. Harvested, Nov. Yield, 14·2 bush. Grain fair. Good forward places. (*See* "Series B.")

Schneider.—Earing, Sept., 2nd week. Harvested, Nov. Yield, 13·4 bush. Stooled well, fine straw, medium height, fair grain. Good forward places. Worthy of further trial, as it strips and thrashes well also.

Mould's.—Earing, Sept., 2nd week. Harvested, Nov. 9th. Yield, 13·4 bush. Stooled well, fine straw. Good grain forward places, fair in others. Rusty. Strips and thrashes well. Well worthy of further trial.

Plover.—Earing, Sept., 1st week. Harvested, Nov. 12th. Yield, 11·4 bush. Stooled well; fine, clean, erect straw. Good grain forward places. Rusty. Worthy of further trial.

C. 12.—Earing, Aug., last week. Harvested, Nov. 9th. Yield, 14 bush. Stooled well, medium straw. Grain fair. Rusty in places. Gave better return than where sown at rate of ½ bush.

C. 25.—Earing, Sept., 2nd week. So badly affected by rust as to be worthless.

C. 33.—Earing, Aug., last week. Worthless through ravages of rust.

C. 50.—Earing, Sept., 1st week. Worthless.

C. 53.—Earing, Aug., last week. Could not be harvested on account of plant not having sufficient root-hold to keep it erect. Worthless.

C. 91.—Earing, Sept., 2nd week. Harvested, Nov. 10th. Yield, 6·06 bush. Fair stooler, short straw, very badly infested with flying smut. Badly rusted. Some fell down and could not be harvested. Fair stripper and thrasher. Good grain forward places.

C. 121.—Earing, Sept., 2nd week. Harvested, Nov. 10th. Yield, 6·9 bush. Fair stooler, short straw. Rusted badly. Fair to strip, good thrash. Good grain forward places.

C. 175.—Earing, Aug., last week. Fell down, apparently owing to having a poor hold of the ground. On this account could not be harvested.

C. 181.—Earing, Sept., 2nd week. Harvested, Nov. 10th. Yield, 8·06 bush. Fair stooler, straw medium height. Good stripper, does not shed. Grain good forward places, remainder pinched.

C. 343.—Earing, Sept., 2nd week. Harvested, Nov. 10th. Yield, 7·4 bush. Fair stooler, long straw, not too good to strip (pulls up); grain pinched. Rusty.

C. 348.—Earing, Sept., 1st week. Harvested, Nov. 10th. Yield, 4·8 bush. Very rusty, grain very pinched. Worthless in such a situation; did much better in larger area, sown later.

C. 349.—Earing, Aug., 2nd week. Harvested, Nov. 10th. Yield, 8·8 bush. Good stooler, fairly long straw, every appearance of being heavy yielder under more favourable condition, medium quality straw. Root system a little deficient, as it pulls up in stripping; good to thrash, does not shed. Worthy of further trial. Grain good forward places.

C. 504.—Earing, Aug., 2nd week. Harvested, Nov. 3rd. Yield, 16·6 bush. This wheat's characteristics embody all those that are essential in a wheat for this part in a season like the present. It is a good stooler, medium height and thickness of straw, strong, remains erect, does not shed, easy to strip, firm hold of the ground. An early wheat, without much flag. A little open in the glumes. Sample of grain good, considering little weathered. In the early part of the season, which was dry, the nice healthy appearance of this wheat was commented on by many. Numerous inquiries for seed of it have been made. Would recommend it for consideration when selecting a wheat for sowing in permanent blocks.

All the foregoing wheats were sown on the 4th and 5th of May. Yield rate per acre weighed bush. of 60 lb.

SERIES B.

These blocks each have an area of 3·24 acres, which was seeded at the rate of ½ bush.

J. Brown.—Sown, May 8th. Earing, Sept., last week. Harvested, Nov. 15th. Good stooler. Yield, 10 bush. to acre. Grain very fair, medium, late. Nice clean straw, erect, strong, even, good to strip, does not shed, not bad to thrash, a handsome crop, slightly rusty. This is a wheat eminently suitable for here; would recommend it with 504.

C. 12.—Sown, May 8th. Earing, Sept., 1st week. Harvested, Nov. 14th. Yield, 8·03 bush to acre. Good stooler, short slender straw, grain small, pinched; one of the first to be badly affected by rust. Would recommend that only a small sowing be made for comparison.

C. 25.—Sown, May 8th. Earing, Sept., 1st week. Harvested, Nov. 13th. Yield, 7·6 bush. to acre. Good stooler, v. medium length straw. This wheat has shown itself to be worthless for a season such as the one just experienced.

C. 348.—Sown, May 8th. Earing, Sept., 1st week. Harvested, Nov. 12th. Yield, 10·2 bush. Grain fair. Good stooler, slender straw, medium height, nice even crop. Rusty. Good stripper, does not shed easily. Well worthy of further trial.

C. 353.—Sown, May 9th. Earing, Sept., 2nd week. Harvested, Nov. 9th. Yield, 9·56 bush. to acre. Good stooler, medium straw, fair height; was a handsome crop, medium late. Rust attacked flag, straw, and ear; grain very pinched; stood up well to be harvested; fair to strip and thrash. This wheat, although growing under same conditions, was only 6 in. high when 504 was 18 in.

C. 504.—Sown, May 9th. Earing, Aug., 2nd week. Harvested, Nov. 2nd and 3rd. Yield, 17·6 bush. (Remarks, *see* "Series A, 504.")

Series C (1).

These blocks, containing an area of $\frac{1}{15}$ acre each, were sown with seed obtained from New South Wales Department of Agriculture. Rate, $\frac{1}{2}$ bush. to acre.

The situation was not of the best, and the clay was within an inch or two of the surface. Had these plots been placed in any other portion of the farm, the results would perhaps have been better, as, besides the two aforementioned detrimental qualities, the ground was very poorly ploughed, the seed being put in practically on the surface, which was very hard.

Bobs.—Sown, May 30th. Earing, Sept., 3rd week. Harvested, Nov. 28th. Yield, 2·5 bush. to acre. Grain frightfully pinched. This wheat, in three different situations and soils, has proved itself, at least this season, a rust-liable wheat, being one of the first and worst affected here, falling down after visitation of fungus.

Bunyip.—Sown, May 30th. Earing, Sept., 2nd week. Harvested, Nov. 28th. Yield, 4·75 bush. to acre. Grain medium, pinched. Did not stool too well owing to poor cultivation; short strong straw, slightly rusty, erect, early. Good stripper and thrasher. Would recommend for further trial.

Cumberland.—Sown, May 30th. Earing, Sept., 2nd week. Harvested, Nov. 27th. Yield, 3·25 bush. per acre. Remarks, "Series A." Did not stool quite so well here.

Federation.—Sown, May 30th. Earing, Sept., 3rd week. Harvested, Nov. 27th. Yield, 2·75 bush. to acre. Poor wheat throughout; very rusty, grain worthless.

Glover (?)—Sown, May 30th. Earing, Sept., 2nd week. Harvested, Nov. 27. Yield, 7·25 bush. to acre. Stooled fair, very nice crop, medium length straw; medium, fine, erect, and clean straw. Good stripper and thrasher, does not shed. Grain, fair quality. Recommend for further trial. This is very similar to wheat called "Plover," medium late.

J. Brown.—Sown, May 30th. Earing, Sept., 3rd week. Harvested, Nov. 27th. Yield, 6·25 bush. to acre. Did not stool as well here as in other places.

Jonothan.—Sown, May 30th. Earing, Sept., 3rd week. Harvested, Nov. 27th. Yield, 1·50 bush. to acre. Worthless.

Rymer.—Sown, May 30th. Earing, Sept., 3rd week. Harvested, Nov. 27th. Yield, 8·5 bush. to acre. Grain fair. Stooled fairly well, medium tall, clean, erect, strong straw; nice even crop, easy to strip. Does not shed. This is a wheat well worthy of further trial, medium season.

Schneider.—Sown, May 30th. Earing, Sept., 3rd week. Harvested, Nov. 28th. Yield, 5·5 bush. to acre. Grain poor, rust-affected, late, portions very badly; stooled fair; medium thick straw; medium late. Good stripper, little difficult to thrash.

Sussex.—Sown, May 30th. Earing, Sept., 3rd week. Harvested, Nov. 28th. Yield, 8·25 bush. Grain fair. Stooled fair; nice, clean, medium fine straw of medium length. Not too rusty. Good to strip, remained erect. This wheat is on a par. with "Rymer."

Tarragon.—Sown, May 30th. Earing, Sept., 4th week. Harvested, Nov. 28th. Yield, 1·75 bush. Grain worthless. Splendid stooler; erect, flaggy, fine straw, splendid for hay. Requires to be sown early. Very rusty; ear does not get well away from shot blade; splendid root system, does not pull up in stripping.

SERIES C (2)

Comprises the "Durum" wheats, which are said to be eminently adapted for growing in situations having a limited rainfall, and, by the results this season, are as well suited for those having an excessive fall, as, on the whole, when taken into consideration with wheats growing adjacent to them, they were, excepting on the outside drill of each block, found to exhibit very little rust. Seed obtained from New South Wales.

Cortan.—Sown, May 9th. Earing, Sept., 4th week. Harvested, Nov. 28th. Yield, 23·75 bush. to acre. Grain long, very hard; stooled fairly well, handsome crop; beautiful clean, bright straw, good height, thick at base, thin at bottom of ear, which are close, well-filled, and bearded. Splendid stripper, good to thrash, difficult to winnow with ordinary wheat sieves, not so bad with barley. Awns not too coarse; these are shed to a great extent if crop is permitted to get dead ripe. Perhaps by selection this may (sheddings of awns) become a fixed characteristic, which would mean a great saving of time and labour at harvesting. No rust.

F. Durum.—Sown, May 9th. Earing, Sept., 4th week. Harvested, Nov. 28th. Yield, 21·75 bush. to acre. The remarks noted on "Cortan" apply to this wheat.

Beloturka.—Sown, May 9th. Earing, Sept., 4th week. Harvested, Nov. 28th. Yield, 20·75 bush. to acre. Grain hard, flinty, red, long. Good stooler. Straw coarse at base, tapering up to ear, clean, erect. Splendid to strip and thrash, awns troublesome when winnowing. This variety does not shed them to such an extent as the two preceding ones. Rust in evidence on flag in places, such as stump holes, where growth was rank.

Kubanka.—Sown, May 9th. Earing, Sept., 4th week. Harvested, Nov. 28th. Yield, 16·50 bush. to acre. Good stooler; grain fair, hard, flinty, long. This variety developed more rust than the preceding variety, more flag, other qualities similar.

Velvet Don.—Sown, May 9th. Earing, Sept., 4th week. Harvested, Nov. 28th. Yield, 16·0 bush. to acre. This wheat is not quite so tall as the aforementioned varieties, is a little thicker in the straw; beard is coarser, therefore more troublesome to winnow; has a white chaff, others reddish creamy tinge; did not show so much rust as Kubanka and Macaroni. Stripped and thrashed well.

Macaroni.—Sown, May 9th. Earing, Sept., 4th week. Harvested, Nov. 28th. Yield, 11·25 bush. to acre. Stooled well; grain fair, pinched, coarse; straw flaggy; rust on stalk, flag, and ear. This is the least desirable variety in this class.

SERIES D.

Small sowings were made on loamy soil of the following varieties, viz:—Morocco, Black Don, Kubanka, Velvet Don. The situation was a very wet one, and the seed so mixed that the results are practically worthless for future reference. An endeavour has been made to obtain pure seed of Morocco and Black Don; the others we have.

Morocco.—Sown, May, 1st week. Earing, Sept., 2nd week. Harvested, Nov. 29th. Yield, 13·8 bush. to acre. Grain long, very hard, flinty; good

stooler; short, coarse straw, flaggy, very compact head, awns very coarse; pulled up in stripping. Heads selected for future sowings from least rusty plants. Contains three or four varieties.

Black Don.—Sown, May, 1st week. Earing, Sept., 2nd week. Harvested, Nov. 29th. Yield, 17·6 bush. to acre. Grain fair, not so large as Morocco, of same quality. Longer in the straw, good stooler, beard very coarse; pulled up in stripping, perhaps owing to the light soil. Rusty. Mixed. A selection made on similar lines as in the last.

Kubanka.—Sown, May, 1st week. Earing, Sept., 2nd week. Harvested, Nov 29. Yield, 15·50 bush. to acre. (*See* "Kubanka, Series C 2.") Too mixed to obtain records from.

Velvet Don.—Sown, May, 1st week. Earing, Sept., 2nd week. Harvested, Nov. 24th. Yield, 20·1 bush. to acre. Grain pinched, difficult to winnow, more so than other block of Velvet Don, owing most probably to the mixed crop.

Series D (2).

Bald wheats—Tarragon, Russian Ulka. Soil and situation same as "Series D (1)."

Tarragon.—Sown, May, 1st week. Earing, Sept., 4th week. Harvested, Nov. 29th. Yield, 1·75 bush. to acre. Grain very pinched, worthless. Late wheat, very rusty; good root system. Too late in maturing for this part. Good for hay.

Russian Ulka.—Sown, May, 1st week. Earing, Sept., 4th week. Harvested, Nov. 29th. Yield, 4·25 bush. to acre. Very late wheat. Not so rusty as Tarragon, but has all its other characteristics.

N.B.—Series D (1) and (2): Sown at rate of ½ bush. to acre. Yields in weighed bush. of 60 lb.

Manitoba, imp. (40 acres—25 lb. to acre).—Sown, May 7th and 29th. Earing, Sept., 4th week. Harvested for grain 3 acres. Yield, 6 bush. to acre. Grain very pinched and light. Splendid stooling wheat; very mixed, very flaggy (erect); fine straw, very suitable for hay. Appears to be too late for grain purposes here. Requires to be sown early; seed to hand too late this season. Remainder of block was cut with binder for hay on account of backward condition and presence of rust being felt and causing it to dry up.

Manitoba (Roma mill—seed, 25 lb. to acre).—Sown, May 11th. Earing, September and October. Harvested, Nov. 30th. Yield, 5·5 bush. to acre. Grain very pinched and very light. Remarks used imp. Manitoba apply to this. Block was sown with a view to ascertaining by analysis whether the quality of the grain from a milling and nutritious point of view deteriorated under the conditions experienced in the Maranoa after a few years. Samples of grain after each harvest to be submitted for analysis; this season the grain will have to be picked.

Budd's Early (area, 3·57—½ bush.).—Sown, April 28th. Earing, Sept., 1st week. Harvested, Nov. 24th. Yield, 4·7 bush. Grain very fair. Stooled fair. This block contains three classes of soil—loamy, gravelly, and stiff black. It was from the former of the three that the grain was garnered. The seed came up directly, and grain was well forward when affected by rust. Heavy soil. The wheat did not come up until late in the season; then it was caught by the rust, and all fell down. A large ironbark, making its influence felt over fully an acre, is situated in this block.

Budd's Early (11·84—½ bush.).—Sown, May 1st. Earing, Sept., 1st week. Harvested, Nov. 23rd. Yield, ·96 bush. Grain fair. Came up very thin and irregular. Soil clay, practically on surface over greater portion. The early ears are the only ones that grain was garnered from, as the rust caused the others to tumble down by its action on the straw. This wheat showed the effects of rust worse than any crop harvested for grain on the farm. It is

worthless as a rust-resister, and is not esteemed in the district as a drought-resister.

N.B.—A few heads have been selected from a number of varieties—viz., Manitoba, Durum wheats, Hermitage—for sowing separately next year, on account of some good characteristic which they may have had, such as earliness, freedom from rust, shedding of awns, &c.

BARLEYS.

Three blocks each, having an area of 2·65 acres, were sown with this cereal. The soil contained in each was ideal barley ground, being new and of loamy character. The season has been an ideal one for the growth of this crop, as the surface soil has been moist throughout the latter part, which is essential, it being practically a surface feeder. During the dry spell in the early stages of its growth it began to turn yellow and show that it could not withstand the same amount of dry weather as wheat. It came up unevenly, and also ripened unevenly, some being ripe four weeks earlier than other. A good deal of the early grain was lost; more especially was this the case with "Carter's Malting." Californian brewing barley was badly infested with rust.

Invincible Barley (malting).—Sown, May 3rd. Harvested, Nov. 6th. Yield, 20·1 bush. to acre. Good to strip and winnow. Fair amount of grain shed.

Carter's Malting.—Sown, May 3rd. Harvested, Nov. 6th. Yield, 20·7 bush. to acre. Good to strip, thrash, and winnow. Fully ¼ bush. to acre shed prior to harvesting, owing to unequal ripening. Both these barleys shed awns a good deal when dead ripe.

Californian Brewing (barley).—Sown, May 3rd. Harvested, Nov. 7th. Yield, 27·8 bush. to acre. Grain pinched. Rusty. Good to strip and thrash, difficult to winnow.

All crops germinated unevenly, and all seed in any block was not through until the end of the first week in June.

A feature which is unavoidable in growing wheats in small blocks is that the outside drill grows taller, ranker, and is later in ripening than the other portion of the crop. The plants in these situations are more liable to have their yields reduced by wind, rust, &c. Again, the main portions yield, in a variety liable to shed, may be influenced by having to wait for this fringe to ripen. In blocks of the same area this does not matter, but in comparing, say, ¼-acre block with a 50-acre block, the difference in yield per acre may be 1 bush., whereas, had same area of each been put in, the same may have been the result. The season, owing to pinched grain, has not been suitable to determine whether a wheat sheds grain easily when ripe or not.

MAZZAGUA AT SPRINGSURE.

The accompanying illustrations, from photos. taken by Mr. F. Jarrott, manager of the Gindie State Farm, prove conclusively that the new fodder plant mazzagua will thrive splendidly in the Central district. It was sown on Boxing Day, 1905. The ground was just moist enough to cause the seed to germinate, but no rain fell afterwards until 22nd January, 1906. Then the plants made rapid growth, until on 17th March they were so high that the grower, Mr. Laver, stock inspector, to whom we are indebted for the photos. and box of seeds, was not able to touch the top of them with a garden fork. Frost occurred before the seed was properly developed, but yet when sown the latter produced good plants. All stock eat the fodder ravenously, and the seed makes excellent poultry food. Unlike maize, the flag continues green right down to the ground. The aphis does not affect the plant at all.

Plate VII.

Field of Mazzagua at Springsure.

Mazzagua, Grown by Mr. Laver, at Springsure.

IMMIGRATION AND THE LABOUR PROBLEM.

In continuation of a discussion on the scarcity of labour in the rural districts of the United States, in a series of articles in the "Southern Ruralist," the "Florida Agriculturist" says:—

Of all the articles written for the "Ruralist Labour Special," only two suggested immigration as a possible solution of the problem of a more satisfactory supply of farm labour. This was probably natural, since the authors confined themselves to personal experience.

It so happens that the writer has had a somewhat varied and extensive experience with labour of different nationalities, in different countries. Opinions resulting from this experience may possibly be of value to the readers of the "Ruralist."

Immigration offers a possible solution of this problem. As such it is worthy of consideration. It is at present attracting much attention, and is receiving much official recognition from several Southern State Administrations.

The first fact bearing on the matter of immigration, from the Southern standpoint, is this: We want the immigration to supply something besides mere labour. We want citizens—men and women who, after they have tilled our fields, shall fertilise our waste places, populate uninhabited lands, and raise children who shall become true Americans.

This excludes the Asiatic from consideration. Even should necessity force us to be satisfied with mere labour, and to accept people incapable of absorption into our complex citizenship, the Chinese, who are often mistakenly supposed to supply ideal labour, should be barred from consideration.

The Chinamen who come to this country are not natural farm labourers. They do not come from agricultural China, but from the maritime provinces, mostly from Canton. Even in California they have been mostly supplanted by Japanese as agricultural labourers. Even the experiment, recently made on a large scale, of introducing Chinese labour on turpentine farms in Florida proved a failure; after a few months the labourers were transported back to the Pacific coast, whence they were brought.

The Japanese are good farmers. They labour intelligently, faithfully, and cheaply. They bring their women with them whenever engaged in numbers. They are well adapted to many of our agricultural demands, especially in the growing of rice, cane, and fruit. In the Hawaiian Islands they have largely supplanted the Chinese. But they are only content when colonised in numbers. Such colonisation of capitalless Japanese is only possible under the contract system. This our present immigration laws prohibit. The Japanese, therefore, need not be seriously considered. Europe must furnish any importation which is to help solve our labour problem. What part of Europe, what nationality, offers most probability of usefulness?

Geographical location will furnish the real answer to this question. Currents of immigration are as well defined as those of streams. Movement with the current is simple and easy. Movement in opposition to the current is difficult or hopeless. All movements of people westward, beginning with the movement of the Arian from the cradle of the human race, has followed lines of latitude.

The Englishman came to New England, the Spaniard to Mexico. Virginia populated Kentucky, Tennessee, and Missouri. New York sent her sons to Ohio and on to Colorado. Maine settled Wisconsin, Dakota, and the Pacific north-west. The German goes to Illinois and Iowa, the Scandinavian to Minnesota.

The stream of immigration most easily deflected to the Southern States must come from Southern Europe. Spain, Italy, and Hungary would most easily supply the immigrants we seek. Italy unquestionably contains the largest and best supply of labour on which we could naturally draw.

Italy is not only a southern country, with climate and crops similar to our own, but it is essentially an agricultural country. The Italian immigrant is most frequently from the country districts, the villages, farms, orchards, and vineyards. He prefers farm work. He grades railroads and digs tunnels, chiefly because he is gregarious and finds such labour conveniently awaiting large numbers of his countrymen as soon as he lands on American soil. He is industrious, frugal, and usually peaceful. He loves the soil, and covets the ownership of a bit of land.

In New Jersey and other sections, where this instinct has been given opportunity to develop, he has transformed worthless wastes into fruitful orchards and gardens. He has built prosperous villages on barren sands. In Louisiana he has solved the labour problem of the sugar-planter, and has nearly driven the negro from the canefield and sugar-mill.

The point of most practical importance to the South is: How is this stream of Italian labour to be turned in our direction?

The stream must be tapped at its fountain head. Full results can only be secured by reaching the Italian in Italy.

Our need and the advantages we offer should be placed before the Italian in his own tongue at home, perhaps even before he thinks of emigration. The surest means toward this end, however, is not by the sending of agents abroad, nor by a literary propaganda.

Very many Italians reach Castle Garden without definite plans, and with no more definite objective point than "America," where work is abundant and wages are good.

The one thing these fresh arrivals want and must have is work, not the promise of labour, but a place secured and means offered for reaching it. The first essential is to list, and contract with, the prospective employers of these immigrants.

Any State, locality, or individual must agree to employ a certain number of men for definite time and pay. Transportation from New York to the new home must often be provided. An authorised agent to meet immigrant steamers is indispensable.

With places provided and guaranteed contracts in hand, hundreds of efficient Italian labourers could be sent from Northern ports to Southern farmers every month. With the stream once thus diverted our way, every Italian on one of our farms becomes the advance agent of friends at home who will naturally swell the current.

Direct lines of steamers from Southern ports to Naples or Genoa would immensely increase the results. Activity on the part of Southern railroads, corresponding to the efforts made by the Western roads, would populate our vacant fields as it has settled the Western prairies.

The all-important truth is this: Immigration will come to us when we provide for it and go and get it. It will never come by our sitting on the porch and extolling the glorious opportunities of the South.

The last two sentences of the above editorial contain the summing up of the whole thing. Almost everyone recognises the fact that immigration is the only solution of the labour problem. If so, then if we want a share we must go after it.

However, for the present, we must do the best that we can with the material at hand. What is the best way, is not easily settled; opinions differ. Two more articles on the subject were given in the same paper with the above, and we believe that they will be not only interesting, but also valuable to our readers:—

THE LABOUR PROBLEM.

The scarcity of farm labour is one of the problems that are confronting the farmer of to-day. There are several reasons why this is so. The two mains ones are: First, the better class of labourers are going into

business for themselves, or on the public works, where the hours of labour are shorter and wages better. If we would keep labour on the farm we must turn over a new leaf ourselves; pay better wages, shorten the hours in the field, make their surroundings more pleasant, try and treat them as you would like to be treated if your positions were reversed. One cannot expect to hire brains for 12 dollars or 15 dollars a month.

Take a look at the average tenant's house, up on stilts, where the wintry blasts have full sweep; doors are unnecessary, as the children and dogs can go in and out at their pleasure through the cracks; no fruit of any kind and often no shade; placed away back in some field with nothing about it to make a real home.

I am paying this year, for a good man, 300 dollars. He feeds himself. I consider I am hiring his time cheap. I always work on the ten-hour plan; leave the house for the field at 6.30 a.m. and the field at 11.30 a.m.; return at 1 p.m. and leave at 6 p.m. Ten hours of snappy work is better than twelve or fourteen dragged and droned along.

I always talk my plans over with my men, and have gotten some valuable suggestions from them. It pleases them, and gives them an interest in my work, and does me no harm. An interested labourer is always a good one; an uninterested one, a poor one. When they have done a job of work well, I always tell them 'tis well done. 'Tis human nature to like praise.

I never work out of doors in a drizzling rain; have work for my help under cover.

Some people have trouble when they hire at a stated sum per month for a year; the man will stay through the winter and early spring months, when work is scarce and wages low, then pack up and move when he is really wanted. I obviate this trouble by paying according to the season. For instance, if I hire a man for 300 dollars a year, for January and February I pay him 15 dollars a month, March and April 20 dollars, the next five months 35 dollars, for October and November 20 dollars, December 15 dollars. In that way I can hold them, for when work is plenty and wages high they are getting as much as they could by the day.

From what I have seen of tenant farming, I do not think I want any of it in mine. If the time ever comes when I cannot hire labour to assist me, I shall have some land to sell. The average tenant farmer has the cottonphobia in virulent form, which to my mind is several degrees worse than hydrophobia. They are prone to plough land when to my notion it is too wet. They will persist in scratching around with one mule, and I want my land ploughed. Then the fodder would have to be pulled, stalk burned, &c. My hair would be grey in six months.

But if I did have them I would furnish a comfortable house to live in, and surround it with something so it would look like a home; furnish cowpeas or some other legume for them to sow; encourage the sowing of small grain; hire them to grub, pick up stone, repair terraces, &c.; and try and bring up their end of the farm. But I hear some say, "There is no money in that for the landowner." I beg leave to differ from those who think that way. Anything that tends to improve your farm is money made. It is the maximum crops that pay. I have heard so many farmers who rent land lay the blame to the tenant for the turned out and galled places, poor crops, impoverished state, and its general run-down-at-the-heel condition. But I find about all the interest the owner took was to see how large an acreage of cotton he could get the tenant to put in.

Let us look at ourselves and see if we are not some to blame for the existing state of affairs. Let us treat our labourers and tenants like men, pay them better wages, shorten their hours, and give them a comfortable home to live in. Then I think we will see them coming back to the farm.

The other article is as follows:—

OUR LABOUR.

When I can get help I manage them the very best I can—that is, in a gentlemanly way, as the character of the help will permit, and appreciate. We pay all the way from 50 cents to 1 dollar per day for day labourers, as the emergency demands. Renters who furnish their own teams and provisions are furnished good houses to live in, barns and outhouses and pasturage for work horses and milch cows and calves, have all the land free for family garden they wish to cultivate, and are encouraged to use more than they do. For this they give one-fourth of the cotton and one-third of the corn as rent, or from 3 dollars to 5 dollars per acre money rent, or if they have no teams or tools they give one-half of the crop. The farmer who habitually rents on "halves" is a poor proposition, and is taken as a last resort.

Hands are very, very scarce. I don't know of half a dozen white farm hands—that is, men who work by the month. The native Texan here is above it. If one can get a green German or Bohemian, just from the old country, they stay and make ideal hands for one year. Then they buy a team, and rent. They get from 12 dollars to 15 dollars per month the first year, and save every cent of it. No rewards are offered, except wages. It is no inducement to the kind of farm help we have here. The negro is uncertain, untruthful, dishonest, and rewards do not appeal to him. The average Texan looks upon it as a disgrace to work as a hand on the farm.

The wage hands get more than the tenants or croppers, for the reason that the wage hands are used only in emergencies; they demand and get good pay, and they do not work as hard as the cropper while they are at work. For instance, lots of hands lay around towns and pick up a bare living till cotton-chopping time. Then they demand and get 1 dollar to 1·25 dollars per day. After this they loaf some more till cotton-picking time, and then get from 65 cents to 90 cents per hundred, or won't move. The 12-dollar a month hand sees this and revolts, never thinking of the long, comparatively idle time he has had. Tenants are idle approximately one half of the time as compared with people who work for corporations, and go to work at 7 o'clock and quit at 6 o'clock.

The time they are idle could be very profitably employed by them if they were inclined to employ it. There are tons and tons of fertiliser they could haul to the fields; there are fall crops of pear, potatoes, &c., they could cut, cure, and haul in for winter feed; there are the cuckleburrs and weeds they could cut before the seed mature. But no. They are migratory. They are not going to stay in the place another year; they hear of a better country just ahead, and move on. That's the rule.

But we have some renters that are exceptions. I know of one who has lived on the same place twenty-five years. He has his own team, cattle, tools, &c. Educated his children, who all dress well, and are accepted in the best of society. There are a few like him, but not many.

The Germans and Bohemians make the best tenants, but they, like all good things, don't last long. They live on a very cheap scale for several years, then make a small payment on a place of their own, move on it, and soon pay for it.

GEM OF THE SOUTH POTATO.

Numerous experiments are constantly being made with the object of evolving a perfect potato, which shall yield heavy crops, be disease-proof, and possess all the most desirable qualities as a table vegetable. Again and again has it been thought that the end was attained in the production of the Sir John Llewellyn, the Up-to-date, the Evergreen, and many others, and extraordinary prices were paid for these and the Northern Star. Yet the end has not yet

been achieved, unless it has been found in the Gem of the South produced by Mr. Kidd, of Invermay, Tasmania. "Farm" (Adelaide) has received from the originator the following account of the already much-lauded potato:—

The object in view was to find a potato which would replace the famous red-skins of the N.W. coast and other districts of Tasmania, and the Warrnambool's of Victoria. These localities have for many years been the chief potato producers of the Commonwealth, and yielded an article that for keeping and eating qualities gave it the premier place in the markets of Australia. Of late years the inevitable deterioration which comes with age has occurred, the yield and quality both being affected, until, at last, attention has been seriously set upon the difficult problem of finding a substitute or substitutes equal in all respects to the original at its best. Many foreign varieties have been introduced, which, in instances, seemed all that could be desired from the yield and quality points of view, but lacked the chief essentials of the red-skin, viz.:—Keeping power, ability to withstand the rough usage of transport, and—most important of all, commercially, and therefore financially—true colour when grown in our characteristic potato soils. The Gem of the South combines all the necessary essentials. It is a very heavy yielder, of splendid cooking and eating quality, firm and sound, and a genuine red-skin of true colour. It was originated in March, 1904.

All the growth of the potato, from its inception up to the present, has been witnessed in public, and all statements made here concerning it can be amply verified by scores, and even hundreds, of unimpeachable witnesses. While exhibiting the facts, there is neither intention nor desire to belittle any of the many foreign varieties latterly introduced. The Gem of the South was raised for a specific object—as before stated—viz., to replace the present commercial and farmers' red-skin potato with a more vigorous, youthful, and profitable tuber of like colour and quality. It is the attention of the growers of the staple and main-crop potato that is here desired—market gardeners and small private growers being affected in a minor degree, a wide range of selection being necessary in their case.

The fashion has latterly come into vogue to style every new variety of potato as pedigreed, by which is meant a cross between any two varieties of repute, or otherwise, as the case may be. The grower of the Gem of the South does not believe in pedigreed crosses—the difficulties to overcome and the uncertainties are so great as to render the fact of a cross an improbability, if not an impossibility, the results from the crossing of two varieties being so varied and distinct, not only between themselves, but also in regard to the parent stocks; and, were this not the case, potato-raising would become one of the simplest, instead of, as is the case, one of the most difficult and tedious problems in vegetable economy. But whatever value may be atttched to cross-bred varieties of potato, supposing a cross to have been effected, the greater value should be awarded to the thoroughbred; and this the Gem of the South must be, for it was raised after ten years of fruitless effort from the seed of the red-skin only. The attested performances—if the term be excused—of the thoroughbred Gem of the South are here given, and, age for age, are probably without a parallel in potato culture.

From First Tuberation.—Weight of seed planted, 3 lb. 14 oz.; length of row, 59 feet; manure, none; soil, a light and poor loam; yield, 307 lb. 10 oz.; rate per acre, 43 tons; ratio of yield to seed, 70 to 1. Planted November, 1904. Dug March and April, 1905.

This plot was tested alongside the Northern Star, Up-to-date, and the commercial red-skins. The Northern Star was beaten by 3 to 1, the Up-to-date by 6 to 1, and the red-skins by about 20 to 1. This is in actual yield—not in ratio of yield to seed—in which case the Gem of the South appears to still greater advantage.

In a special plot a 2-oz. tuber of the Gem of the South was planted after being cut into 11 sets, and dug in presence of a numerous attendance of the

public. The total yield, from 12 feet of row, was 62 lb. 11 oz., or 501 times the seed. This established a world's record—the first three roots, in 3 feet of row, weighing together upwards of 30 lb.

The 370 lb. obtained from the two plots were planted in the succeeding season. Over 13,000 sets were cut—an average of over 35 for every 1 lb. of tuber—each set containing but one eye. The cultivation given is here shown. Yield, 132 sacks.

Trenches were dug in each plot to a depth of about 10 inches, and in these stable litter was placed to a depth of 2 inches, and about 4 or 5 inches of soil drawn in on top. Superphosphate, at the rate of 2 cwt. per acre, was then applied, and the sets sown. About 4 inches of earth was drawn over the sets, and no further cultivation given. The sets were 12 inches apart, and the rows 3 feet. From the date of sowing until digging the season was particularly rainless. An ironstone gravel substratum caused the soil to be less retentive of moisture than would a clay subsoil, while the situation on a steep slope aggravated the dryness. In addition to this, the land was not potato land, so that all the conditions of soil, situation, and season were very adverse to anything like a good yield, while the fact that the sets were very small and limited to one bud each added additional factors to militate against a record crop.

Four special plots were reserved:—

No. 1.—Whole set, 5¾ oz.; yield, 19 lb. 2 oz.

No. 2.—One tuber in 16 sets, weight of tuber, 4½ oz.; length of row, 16 feet; yield, 92 lb. 7 oz., or nearly 6 lb. per foot.

No. 3.—Three pounds of tuber (very small), cut into 344 sets, planted 24th November to 1st December, 1905; dug April, May, and June, 1906; total yield, 1,376 lb. (the estimated yield was 1,200 lb.). From 17 feet of row in this plot 114 lb. were lifted.

No. 4.—This plot was planted to test to the severest limit the vigour of the variety. One pound weight of tuber, before cutting, was placed on the scale. A photograph was taken. The tubers had been selected in March, 1905, and ranged in size from a pea to an acorn. They were carefully cut to single eyes—about seven from each tuber—and planted 1st January, 1906. The number of sets obtained was 284. The plot was dug in April, May, and June for a yield of 1,132 lb.; or, 10 cwt. 0 qr. 12 lb.; or, The World's Record.

In all these special plots less cultivation was given to the plants than any ordinary field crop receives. The manure applied was less than any potato crop should receive. Neither sulphate of ammonia nor sulphate of potash was applied to plots 3 and 4. All diggings were public, and throughout, from the planting onward, no person has been refused admittance at any time. Hundreds of people have been witnesses of one or more diggings, visitors including Victorians, New South Welshmen, and New Zealanders, while the Tasmanians were representative of those most anxious for the welfare of the State—viz., the mayor and aldermen of the city of Launceston and the city officials, Senators, members of both the State Houses, doctors, leading citizens, and, above all, practical farmers from all parts of the colony and Press representatives.

The practical farmers are unanimous in their good opinion, and only differ in the degree of praise.

A special field test was given, by request of a member, before the members of the Council of Agriculture. This test was very severe. The ground selected was mostly hungry ironstone gravel—almost fatal to successful potato culture, and was not planted until 12th January, 1906. Neither watering nor cultivation had been given; the season was rainless; the sets cut to single eyes; yet the yield returned was 11 tons 17 cwt. 2 qr. per acre, and the ratio of yield to seed over 100 to 1; but the plot was watered prior to planting.

The varieties grown alongside were noted yielders—viz., Adirondacks, Burbanks, and Freemans. These barely returned the seed.

The Gem of the South has been tested against other varieties both inside and outside the grower's property, and in no case has been beaten, while in most it has been superior. It has invariably followed that, as the conditions became more favourable, so the margin widened between the Gem of the South and all other varieties. As these included Northern Star, Up-to-dates, Factor, Duke of Albany, Gold Coin, and other varieties, as well as the three mentioned before, it will be seen that the comparisons covered a sufficiently wide range to fix the relative yielding powers with some certainty.

The chief performances of the Gem of the South may now be summarised:—

From first tuberation—2 oz. yielded 62 lb. 11 oz., or 501 times.

From second tuberation—3 lb. yielded 1,376 lb., or 458 times; 1 lb. yielded 1,132 lb., or 1,132 times.

Owing to the dry season, the last two plots were watered.

The rate of yield varied from 5 tons to 43 tons per acre, and the variations were entirely due to soil and season. The quality of the soil was such that no practical farmer would think of planting potatoes in it. For this reason the seed potatoes from it are likely to be the very best possible.

In all the experiments described no false culture was permitted, such as unscrupulous seed-raisers follow, everything done was genuine and thoroughly attested, and gives the Gem of the South a double claim to the title of "The World's Record Potato."

DEEP PLOUGHING.

Whilst all up-to-date practical farmers and sugar-planters are perfectly in accord as to the advantages of and necessity for deep ploughing, the generality of farmers do not practise it. The reasons for not doing so are many. Some say, Why should we plough deep for wheat, when wheat, like other grasses, is shallow rooting? Others object, on the ground that it is a mistake to turn up any soil from a greater depth than 6 inches. You turn under the rich top soil, and bring up the poorer stuff. There is another objection brought forward which may carry some weight in certain seasons, but will not always hold good. The deeper the ploughing the slower the work. If ploughing has been delayed owing to continued wet or continued dry weather, the seed must be sown in the season, and hence, to get the work of preparing the ground speedily, shallow ploughing cannot be avoided. But in normal seasons, when genial rains alternate with short, dry spells, there is plenty of time to get over the work, and deep ploughing should, in such cases, be the rule. Undoubtedly it gives harder work to the horses, but they need not be worked so long as if the ploughing were very shallow. The advantages of stirring the soil are such as to fully counterbalance the extra time and labour demanded by the work. The deeper the soil the further the roots of crops will go down, and the better will they be able to resist the effects of dry weather. Of two adjacent fields, one deeply ploughed, say, to 10 inches, the other scratched to a depth of 4 to 6 inches, the former will, during a dry spell, provide nourishment and moisture for the crops, whether they be cereals, potatoes, or roots, whilst the crops on the latter, especially grass crops, will wither or, at best, yield indifferent crops. This has been shown time after time in the cultivation of sugar-cane. Deep ploughing, subsoiling, cross ploughing, and harrowing down the surface to a very fine tilth has resulted in doubling, and even quadrupling, the yield of cane, even when the same quantity and class of manure has been applied to the shallow as to the deep ground. It is by deep ploughing and careful surface cultivation that the arid soils of the United States have been made to return crops which it had been thought were impossible to produce. The secret lies in the collection of whatever rainfall may occur in the deep ground. Thus there is provided a

reserve of moisture, which, owing to the fine mulch-like surface, is retained below, and only supplied slowly to the plant, evaporation being very slow. There can be no question of the benefits derived from deep ploughing, and those who have tried it maintain that it amply repays the extra labour and expense it involves. Once the work is done, the benefit will be felt for many succeeding crops; consequently, the expense may justly be debited, not to one crop alone, but to those following for several years.

CONSERVATION OF FARMYARD MANURE.

Experiments made by the late Dr. Voelcker showed that 5 tons fresh farmyard manure are reduced to 4 tons if allowed to lie until the straw is half rotten; 5 tons are reduced to 3 tons if allowed to ferment till it becomes "fat or cheesy"; 5 tons is further reduced to 2½ tons if completely decomposed. Bulk for bulk, well-rotted manure is rather stronger than fresh manure, but that slight concentration is obtained at the cost of the weight, as above, and corresponding loss of nitrogen. Chemical analysis has shown that 5 tons fresh farmyard manure contain about 40 lb. nitrogen, and that the nitrogen is greatly dissipated during storage, until when completely decomposed it has lost about one-half of its most valuable constituent.

It is, therefore, best to use it fresh when possible. Professor Massey, of the American Agricultural Department, writes on this point:—"The place to rot the manure is the soil where you have the soil to absorb everything." He advocates the use of manure applied to the soil, and says that evaporation does not take away much more than the water, and that the manure spread on the surface acts as a mulch. He gives an instance of the successful application of fresh manure to the surface of a heavy clay, thus:—"Last summer was the hottest, driest, ever known here, but it was pleasant to see how things grew and flourished. I use all manure as a mulch, either on garden or field. It is spread over the surface, and left there to slightly work in during cultivation." German experiments prove that there is little practical use in employing chemicals, such as kainit, superphosphate, gypsum, &c., to fix the ammonia in manure, the cost being greater than the benefit obtained. The general conclusion arrived at is that excessive loss during storage can be best avoided by storing it in a deep mass in a watertight dungstead placed in a well-shaded situation, in which the material is firmly compressed. The most convenient and effective way is by treading of cattle—

> Keep it moist, and head it tight,
> It will well your care requite.

The use of a considerable quantity of moss litter is strongly recommended. This substance not only absorbs and retains the liquids but tends to fix the ammonia.—"Mark Lane Express."

SPECIFICATIONS FOR A BRICK SILO.

Excavation.—Excavate as required for footings and floorings; trenches to be the neat size dimensioned, and levelled off true and fair in the bottom.

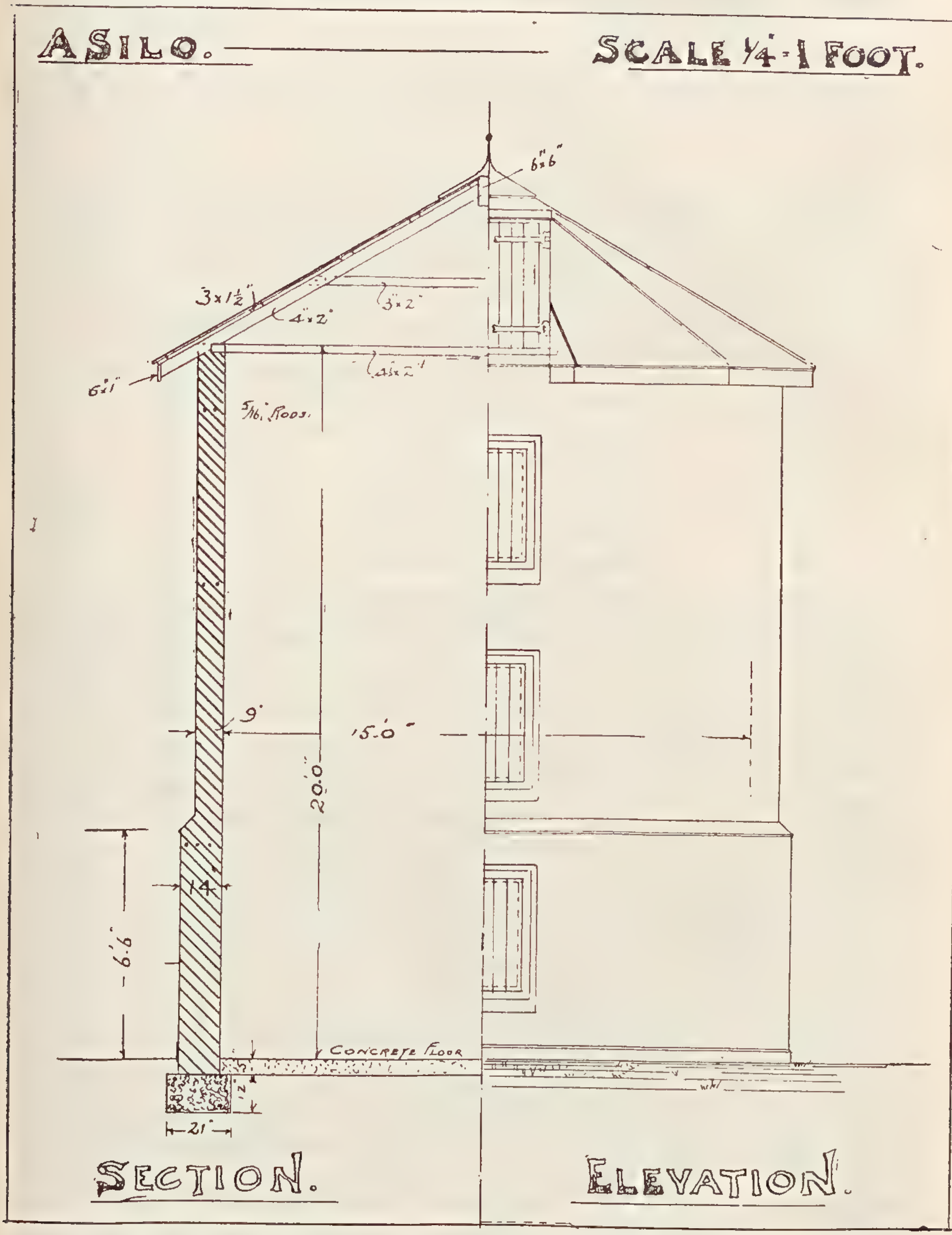
Concrete.—Concrete for footing to be composed of 3 parts hard stone, 1½-inch gauge, 2 parts 1-inch gravel, 1 part clean sharp sand, and 1 part best Portland cement. The whole to be well mixed and filled into trench, and well rammed and finished level. Concrete for floor to be of similar mixture.

Brickwork.—Bricks to be sound, hard, and well burnt, and must be thoroughly well wetted before using.

Mortar to be composed of 3 parts sand to 1 part Portland cement. All joints to be solidly grouted. Joints to be ⅜-inch, and neatly struck externally

to give key to rendering. Construct walls as shown of the thickness and to the heights dimensioned.

Build relieving arches over all openings; arches to spring clear of frames, and to consist of two rings of bricks on edge.



At points shown, build in $\frac{5}{16}$-inch iron bars; these to be curved to radius and cogged at ends 2 inches. Build in all door frames and plates. Plates to be laid from 12-sided figure and halved at intersections, and bear on wall full length. Beam fill solid to top of rafters.

Plasterer.—Render floor as soon as laid with compo. ½-inch thick, thoroughly well trowelled. Render all interior walling, reveals of openings, weatherings, and base with cement compo. finished ½-inch thick, and thoroughly well trowelled. Compo. for this work to be composed of 2 parts sand to 1 part Portland cement.

Carpenter.—Door frames to be made of styles 4-inch by 3-inch sills, and lintels cut to sweep externally out of 3-inch stuff. All hardwood well framed up. Frames to be rabbited. Provide to each frame, and attach with 3-inch by ½-inch coach screw, 4 ties made of 3-inch by $\frac{5}{16}$-inch W.J. turned up on timber 3 inches. Fascia to be of 6-inch by 1-inch pine, well secured to rafters.

Plumber.—Cover roof with 24-gauge galvanised iron, approved brand, well secured with 2½-inch 9 lead-head nails. Cover pipes with 14-inch capping, well secured. Cover top and sides of dormer with 24-inch gauge flat sheet iron, well secured. Provide and fit to apex of roof a cone 24 inches diameter, and well secure.

The dimensions of the silo built according to the above specifications would be 15 feet in diameter, with a height of 20 feet. The cost would amount to about £123. The cost of delivery of material from railway to the site on which the silo is to be erected would have to be borne by the owner of the farm.

MARKET GARDENING.

NOTES FOR BEGINNERS.

Although it is not possible to lay down absolute rules for seasons of planting in all districts of a State which covers so large an area as Queensland, and in which it may be said that all the climates of the temperate, sub-tropical, and tropical world are to be found, still there are some general principles which apply in almost any part of the country in relation to market gardening. Therefore, a few brief notes on this interesting form of agriculture will be found of service to those who are about to enter upon the business without any previous knowledge of the times and seasons for sowing and transplanting. Some vegetables may be sown where they are to remain and produce a crop, but most of them are best raised from seed in seed beds, to be afterwards transplanted. The seed beds require careful preparation. The soil should be a friable sandy loam, and must be as clean as deep cultivation, the removal of roots, and the destruction of weed seeds can make it. It must be fairly rich, or must be made so with well-rotted manure or leaf-mould. A clayey soil is to be avoided, yet it should not readily fall away from the roots when the plants are lifted. A light shade of bush material should be provided, not dense, but just sufficient to allow the broken sunlight to fall on the young seedlings. Ti-tree boughs are the best for this purpose. They can be supported on forked sticks and saplings. As the plants grow, the shade should be reduced, otherwise they will, in seeking the light, grow up spindly and weak, and no such seedling will ever make a satisfactory plant. Sow the seeds thinly in drills, and instead of raking them over, which process often results in the seeds being dragged into a heap, shake fine leaf-mould thinly over them, bearing in mind that vegetable seeds should not be covered deeper than their own diameter. When watering, do so in the evening, and next day stir the soil gently between the drills to prevent the possibility of the soil baking.

Broad Beans.—This vegetable likes a stiff, deeply-cultivated soil, well drained and heavily manured. Mark out the rows 2 feet apart if a dwarf variety is sown, and 3 feet apart for the tall sorts. Set each seed 5 inches apart in the rows. About 4 quarts of seed will be sufficient for an acre. As soon as the

beans are set, nip off the tops of the plants to make them throw all their energy into maturing the beans.

French Beans.—These may be sown at the same distances apart as broad beans, but the soil should be lighter and warmer than for the latter; 2 quarts are sufficient for 1 acre. They may be covered 1 inch deep, and, as they grow, hill them up. This helps to retain moisture and to support the plants. The running or climbing varieties should have their runners cut, to throw strength into the pods.

Beets.—Sow the seeds where there is abundance of light and in the position where they are to mature. If necessary, however, they may be transplanted. The soil must be dug deeply and even trenched two spades deep, digging the manure deep down to induce the tap root to go down in search of the food, of which they take up great quantities. Beets are a very exhausting crop. Mark out rows 18 inches apart, scatter a little fine soil along these rows and sow the seed on it as thinly as possible, because the plants will have to be thinned out to 9 inches apart from plant to plant. The seeds should be steeped for 12 hours in cool water, and be sown whilst still damp. Cover to about half an inch. Two ounces of seed are required for an acre.

Broccoli.—Broccoli thrives admirably in this State, but it will not grow properly in the hot summer months. It requires a rich, deep, light soil, and should never be planted on ground which has previously been under any of the cabbage family. The seed bed should not be shaded by trees: the movable shade above mentioned is all that is needed. When planting out, place the plants about 2 feet to 2 feet 6 inches apart. White and Purple Cape, Grange's Early White, and Elletson's Mammoth are good varieties. Two ounces of seed will suffice for an acre.

Brussels Sprouts.—This excellent vegetable thrives best in the cooler portions of the State, such as the Darling Downs. It is best grown on poor soil. The plant rises up with a very long stem. The top leaves form a spreading head. The large leaves should be broken down to facilitate the formation of the little cabbages which are produced from the axil of every leaf. Heavy manuring should be avoided, as it causes loose, tasteless sprouts to be formed. The sprouts should be gathered when they have the appearance of half-blown roses. Plant out in rows 3 feet apart with 2 feet between the plants in the rows. Two ounces of seed will sow an acre.

Cabbage.—The magnificent cabbages seen at the various shows afford ample evidence that the climate is admirably adapted for their production. Cabbages love a deep, rich, open soil. Give them plenty of manure and frequent watering. The seed may be sown broadcast and thinned out afterwards, but generally it is preferable to sow in seed beds and transplant. Sow in drills and cover lightly with leaf-mould. Then water gently. When the seedlings are from 4 to 6 inches high, transplant them into rows from 18 inches to 2 feet apart according to varieties. It is well to snip off the extreme ends of the roots before planting out. Digging between the growing crops will be of great advantage in keeping the soil loose. After digging, draw some soil up to the stems of the plants. Mulching, liquid manure, and a little lime are all factors in producing large, well-flavoured cabbages. St. John's Day, Early York, Large York, London Market, Sugarloaf, King, and Flat Dutch are good early and medium sorts; whilst for late crops Schweinfurt and Drumhead are suitable.

Savoy Cabbage does well here. Its cultivation is the same as that for ordinary cabbage. Dwarf Greening, Curled, and Drumhead are the varieties usually grown.

Cauliflowers may be treated in the same manner as cabbages, except that when the flower is forming some of the leaves should be tied across to preserve the flower from discolouration by exposure. The best kinds to grow are the Large Asiatic, Eclipse, Early Dwarf, and Le Normand.

Carrots.—The carrot requires a light, rich, sandy loam of considerable depth, which should be dug two spades deep. The ground should have been heavily manured for a previous crop; thus the manure will be evenly distributed throughout, and good clean carrots will result. Get the surface of the ground fine, and sow either broadcast or in drills. As the seed is liable to hang together, it should be well rubbed in the hands, mixed with sand to separate it previous to sowing, and, as it is very light, it should be sown on a calm day. On light soil, not subject to binding in wet weather, the seed should be gently and evenly trodden or rolled in, and then raked. On land of a more retentive nature, it should be raked in only. Thin the plants out to 5 or 6 inches apart, and ply the hoe freely to keep down weeds and stir the soil. Early Horn is a fine-flavoured carrot, and, on account of its habit of growth, is adapted for cultivation in soils which would be too shallow for other varieties. The Intermediate, Long Orange, and Altringham are suitable for deep soils, and the latter and the White Belgian are excellent food for cattle and horses.

Celery.—A good, deep, rich vegetable mould in a moist situation is that best suited for celery. For the seed bed or box, make up a mixture of fine loam, leaf-mould, and sand. Sow the seeds thinly, cover very lightly, preferably with sifted stable droppings or decomposed manure, and slightly shade them. When the plants are up and the rough leaf is a little advanced, prepare a bed by mixing 2 inches in depth of well-rotted manure with about 3 inches of the soil. Level the surface, water thoroughly, and, a few hours afterwards, in the evening, plant out the seedlings 5 or 6 inches apart. Slightly shade them, and then prepare a similar bed for planting out for succession. For the final planting, throw out trenches 1 foot broad and 1 foot deep, at 5 feet apart from centre to centre. At the bottom, lay 4 inches of well-rotted manure, and dig it in with a fork. Give the whole a good soaking with water. Now take up your plants, being careful to leave a ball of earth on the roots. Now take a stiff piece of brown paper, and make a collar or case, and wrap it round the lower part of the plant, leaving the top free. As the plant grows, this can be lifted. The object of this is to enable you to heap in the soil against the plants without any of it getting inside them. Keep on drawing the earth up to them to within 6 inches of the top. This must always be done in dry weather. Give plenty of water and occasionally some liquid manure. A little salt sprinkled on the soil once or twice, followed by a good watering, will be beneficial. One ounce of celery seed will be sufficient to plant out an acre. We have blanched celery by letting the plants grow to 1 foot or 15 inches, and then enclosing them in an earthenware drain pipe. The whole of the plant inside the pipe was perfectly blanched.

Onions.—A rich mellow soil with a dry subsoil is what onions demand. Give the ground a deep digging in January or February, with a good supply of manure, leaving it as rough as possible. At the end of February, give the ground a good dressing of soot and ashes, and dig it over, breaking all the lumps. Throw it up into beds of convenient width, and sow rather thickly in drills 1 foot apart and 1 inch deep. Tread the seed in firmly, and rake over lightly. When the plants are 6 inches high, transplant into beds similarly prepared into rows 15 inches apart and 8 inches from plant to plant in the rows. In transplanting, only the root must be placed in the ground; the little bulb must be above it. By planting deep, the proper development of the bud is prevented. Keep the ground perfectly clean during all the growing time, and when the leaves begin to turn yellow bend down the tops just above the bulb to facilitate ripening. Onions may also be sown in drills and thinned out to 8 or 9 inches between the plants, the plants which are removed being used either to fill up misses or to form new beds. About 8 ounces of seed will serve for an acre. The best time to plant out onions is April, but splendid crops have been got by sowing in September.

Leeks.—Leeks may be treated when transplanted from the seed bed in the same way as celery—namely, by planting in trenches and earthing up. The leaves may be shortened back two or three times during the growing season.

Lettuce.—Sowings of lettuce may be made monthly for succession in seed beds. In very rich soil, lettuce may be sown and afterwards thinned out to 15 inches apart. Cos lettuce may be blanched by tying the plant round with banana-fibre, bringing the top to a point, so as to prevent the rain entering.

Endive.—This salad plant may be cultivated and treated like the lettuce.

Garlic.—Garlic, like eschallots, is propagated from the young bulbs. They should be planted in the winter. Press the lower half of the bulbs into the soil. Leave them in this state, without covering, until the spring. Then, when hoeing, draw the soil over them, so as to form a level surface. The soil that suits onions will also suit garlic.

Eschallots.—These may be propagated throughout the year by division of the roots. Plant in the same way as onions, in rich sandy soil, and keep them well watered. By planting them on the top of small ridges, the roots only will be in the ground, and the bulbs will develop like small onions.

Parsnips.—These are cultivated in the same way as carrots. They take a long time to come to maturity.

Peas.—Peas may be sown from January to May, and even later. Yorkshire Hero, sown in May or June, is an excellent cropper. They require a rich, light, well-drained soil. They should not be sown too thickly. The dwarf sorts should be sown in drills 2 feet 6 inches asunder, the peas being thinned out to 5 or 6 inches apart in the rows. The very tall varieties should be planted 8 feet apart, and two rows of cabbages may be grown between.

Kohl-rabi.—This excellent vegetable is not appreciated in Queensland as it should be. It is really a turnip-rooted cabbage. It should be planted on heavily-manured land, 18 inches apart each way. The bulbous portion of the root above ground and the youngest leaves are eaten. They should be gathered quite young, as the turnip-like flesh inside toughens with age.

Spinach.—Sow thinly in well-dug, well-manured land, in drills 18 inches apart, and thin out to 9 inches apart, using the young plants for table. When the plants are well developed, keep on using the outside leaves for culinary purposes until the flower stalks appear. The prickly spinach is the most hardy and best suited for the winter crop—the round variety for the summer crop.

Radish.—Sow occasionally throughout the year on rich soil. Sow thickly, and thin out as they come on. Make sowings about every fortnight for a succession.

Rhubarb.—Rhubarb roots are so easily procurable from seedsmen that we do not advise market gardeners to go to the trouble of raising plants from seed. If the seeds are sown in August, it will be June before the roots are ready to plant out for good. Plant the roots 2 feet apart each way, in very rich, moist soil, free from stagnant water below. Water occasionally while growing with a weak solution of guano, liquid manure, or soapsuds. Cut the flower stems as they appear. Should they appear during the first year, it is a sign that the ground is not rich or strong enough or has been badly prepared. Mulch during the hot weather.

Artichoke (Jerusalem).—Jerusalem artichokes are propagated like potatoes. They will thrive in any situation, and spread so much as to become troublesome to eradicate. Plant in the spring, but even in February and March if tubers have not been available before those months. Plant 15 inches apart, in rows 3 feet apart.

Artichoke (Globe).—This is another of the vegetables neglected in Queensland. The plant is propagated by means of suckers, which are planted early in spring, when about 10 inches high, in rows 4 feet apart and 3 feet from plant to plant, in deep, rich, moist loam, well manured. The situation should be open. Shade with large pots, and water freely in dry weather. In October, remove all small suckers, and mulch the ground with 3 inches of manure. The beds will last five years.

Asparagus.—For asparagus beds, the very best soil must be chosen. The best is a good, deep, sandy loam, dug deep and well manured. A sprinkling of salt should be added to the surface a month or two before the planting season. Just before planting, the ground should have another good dressing of well-rotted manure, be again trenched, at least 2 feet deep, and again well sprinkled with salt. During May or June, mark out the beds 4 feet wide, running north and south. Cut a trench 6 inches deep perpendicular about 9 inches from the side; against this place the plants, at 15 inches asunder, with great care, spreading the roots out and leaving the crowns 2 inches below the surface. Fill in the earth quickly to avoid too long exposure. Now make two other rows in the same manner, and the bed is complete. Until the plants are established, give them plenty of water in dry weather. From September, right through the summer, apply liquid manure plentifully twice a week, and also give a dressing of salt every month. In May cut the stalks down, and dig the beds lightly over with a fork, at the same time digging up the paths between them. For the winter, cover the beds with a good dressing of manure. Begin to cut in September, using a long knife and cutting below the surface. To ensure the tender shoots being well blanched, the European growers place earthen pipes or wooden tubes, about 1 foot long, over them.

Herbs.—No vegetable garden is complete without herbs. These are generally easy to raise from seed. If plants can be obtained, so much the better. They may be sown any time between April and August. Each particular variety should have a small bed, about 3 feet wide, to itself.

Fennel is propagated from seed or by division of the roots.

Marjoram.—Sow in light soil and thin out, or in boxes. It grows and spreads rapidly.

Mint.—Propagated by division of the roots. Will grow in any fair garden soil and spread rapidly, the roots running a long distance underground and sending up shoots at every joint.

Parsley.—This most useful herb may be sown two or three times a year, but preferably in February or March and in August. Sow thinly, in drills 10 or 12 inches apart. When the plants are strong, cut them down, to induce strong, curled foliage. If not regularly cut, parsley plants will go to seed in one season.

Sage.—Like other shrubby herbs, sage may be grown from seed, by division of roots, and by cuttings.

Rosemary and *Thyme* are propagated in the same manner.

To Dry Herbs.—Gather on a dry day as the flowers are beginning to open. Carefully go over them, and remove dead leaves and any foreign matter. Tie in little bundles; hang in a dark, dry place, where a draught can get at them. When quite dry, rub off the leaves, sift and clean out all dust and twigs. Then place the leaves in wide-mouthed bottles, and seal airtight. Do not on any account dry herbs by sun or fire heat. If they are treated as above, they will keep their flavour indefinitely.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Returns from 1st to 31st December, 1906.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
No. 48 ...	Ayrshire Sh'rth'rn	30 Nov., 1906	974	4·0	43·63	
Dripping ...	Holstein ,,	28 Nov. ,,	945	3·9	41·27	
Linda ..	Ayrshire ...	12 Nov. ,,	873	4·1	40·08	
Careless ...	Jersey	2 Nov. ,,	844	4·2	39·70	
Whitefoot ...	Holstein Sh'rth'rn	7 Nov. ,,	980	3·6	39·51	
Blanche ...	Ayrshire ...	18 Nov. ,,	799	4·3	38·47	
Dott ...	Shorthorn ...	18 Aug. ,,	699	4·8	37·57	
Count ...	,, ...	20 Nov. ,,	969	3·4	36·89	
Bliss ...	Jersey	3 May ,,	548	5·2	31·91	
May ...	Shorthorn ...	31 Oct. ,,	767	3·6	30·92	
Rosebud ...	Ayrshire ...	3 Sept. ,,	651	4·2	30·62	
Nambour ...	Holstein Sh'rth'rn	21 Nov. ,,	714	3·8	30·38	
Dora ...	Shorthorn ...	29 May ,,	644	4·1	29·57	
Honeycomb Pleasant	,, ...	19 July ,,	584	4·5	29·43	
Pleasant ...	,, ...	9 Nov. ,,	767	3·3	28·34	
Winnie ...	,, ...	11 Sept. ,,	776	3·2	27·81	
Remit ...	Holstein Ayrshire	19 Nov. ,,	742	3·3	27·42	
Belle ...	Jersey	4 Oct. ,,	658	3·6	26·55	
Carrie ...	,, ...	3 Dec. ,,	560	4·2	26·34	Milk first weighed on 10th December, 1906
Lottie ...	Ayrshire ...	7 July ,,	562	4·1	25·80	

NEW DAIRY REGULATIONS.

On the 1st January next two very important regulations affecting the dairying industry of Queensland will come into operation. These regulations have not been compiled in any hasty manner, or without due regard to the consequences they entail. Not only has Mr. G. S. Thomson (Government Dairy Expert) pronounced very strong and decided opinions upon the evils attending the present system of carting and pooling cream, but factory managers and proprietors, whose advice has also been sought by the Department, are one and all unanimous in their condemnation of the existing methods. It must be borne in mind, however, that the collecting cream carts are of incalculable assistance in developing the industry, and one has only to peruse the statistics to see the immense strides made during the last few years. Particularly to the new selector do the advantages of disposing of his cream product practically at his own door seem immense, and there can be no question of doubt that many successful dairymen have been induced to make a start through having the inconvenience and loss of time (not to speak of the expense of at least three sets of cans), occasioned by having to cart the cream either to a railway station or factory, removed.

The continual increase in the number of cream cans on each collecting route necessitated the pooling or mixing of one farmer's cream with another, so that the wagons would not be filled with half-empty cans. By this means what threatened to become an increasing expense was considerably minimised.

The time has now arrived, however, when we must carefully consider whether these advantages and savings are not more apparent than real. If

the quality of our manufactured article has and is deteriorating, then the causes must be sought and remedied. The Dairy Expert contends most emphatically, and with his opinion we entirely concur, that the pooling system —the mixing of good with bad, fresh with stale, tainted with sweet cream, by carters who do not pretend to have any great knowledge of the qualities—is responsible very largely for the deterioration in our butter.

If the new regulation, therefore, be strictly enforced, it should make for a decided improvement in the quality of Queensland butter. The dairyman will naturally ask, "But how am I to be benefited? I must provide myself with more cans, the cartage charges will be greater, so that it would appear I am to be penalised in order that better butter shall be produced?" The answer is simple, plain, and clear. A better article will naturally obtain a higher price, and the cream supplier will undoubtedly receive a greater benefit in the shape of price for his cream than the savings which he effects under present conditions.

To our mind, therefore, the dairymen of this State should welcome the New Year, as this one little regulation promises to be the means of augmenting their incomes considerably.

* * * *

Another regulation which affects another department of dairying is that the whey shall not be permitted to be taken back to the farms in the vessels in which the milk is brought. All countries who have made any claims to good dairying have insisted upon this provision. It has come to the knowledge of the Department that the whey is oftentimes delivered from the factories in anything but satisfactory condition, and the farmers do not empty their cans for some hours after they reach their farms; the result is that the whey develops the strongest and most destructive acids, which take away the tin from the can, and leave it finely perforated, making the vessel unfit for carrying milk, as, in the minute crevices, this destructive germ life is located, and is able to live, and the smallest quantity of such life is sufficient to turn the very best milk in a very short space of time to a condition unfit for cheese-making.

As the Queensland cheese is now being pushed in interstate markets, it is desirable that the quality should be very much improved, and Mr. Thomson (the Government Expert) is of the opinion that this is one of the causes which at present operates to prevent cheese-makers in Queensland attaining any high perfection of quality. As milk for cheese-making purposes has invariably commanded very much higher prices than those obtained for butter, it is to be hoped that the farmers will not consider the duplication of cans any serious expense. Indeed, when we consider that such people as the Silverwood Dairy Company propose to wash the cans for the farmers, it will be a distinct advantage rather than otherwise to have the whey taken home in other cans than the ones in which the milk is brought. The intention of the Silverwood Company is to have washing arrangements at each place so that the farmer—immediately the milk is delivered—can have his can thoroughly well washed, and so be ready for his next milking.

If dairymen would only help the factories by ærating their milk (especially during the summer months) they would greatly help to enable cheese-makers to turn out an article that would command high prices.

The trouble with Queensland cheese is that it develops too much acid, and has not the sweet acid flavour which a first-class Cheddar cheese should have.—"Silverwood Gazette."

HOW TO INCREASE THE PERCENTAGE OF BUTTER FAT IN MILK.

When a cow is in full milk and full flesh, she will give her normal quantity of milk for at least a limited time, even although the quality and quantity of the food be very deficient.

ERRATUM.

The Regulation on p. 74 relative to whey is in abeyance, and will not be put into operation pending the consideration of another means to attain the object desired, as pointed out by the recent deputation to the Minister.

When in good condition, a cow will take off her body whatever is deficient in the food, in order to give her normal quality of milk.

An extra supply of nutritious food at all times increases the quantity of milk, but the percentage of fat is not in any way improved by it; if anything, the tendency being rather the other way.

An extra supply of nutritious food almost invariably very slightly increases the solids, not fat, of the milk, but has little appreciable effect on the fat.

With a poor ration, a cow in full milk will lose carcass weight, while on a rich diet she will increase in weight.

Although the percentage of fat in a cow's milk may vary daily, we, at present, seem unable to control these variations or to account for them.

For limited periods up to one month or thereabout, all ordinary quantities and qualities of foods seem to have no material effect on the quality of the milk.

The only food which seems to have had any material effect on the percentage of butter in the milk is an excess of brewer's grain.

Very succulent grass has had only very trifling effect in altering the percentage of fat.

Most foods may convey some flavour to the butter, but scarcely any of that will alter its percentage in the milk.

Some foods exercise a material effect in raising the melting point of butter.

The aim of all producers of milk, butter, or cheese should be to feed what will give quantity, in moderate amount and mixed nature, and the produce will be the best that the cow can give.

Extra quality must be looked for by improving the breeds and judicious selection, rather than by any special foods or methods of feeding.

The variations in the percentage of fat in a cow's milk are caused by something, but what that something is we, at present, do not know; though, if we did, we might be able to influence the quality.—"Silverwood Gazette."

A FAMOUS COW.

The choice of breed when selecting cows which are likely to prove the most profitable to the dairy farmer is one of vital importance. The plodding but persistent and indomitable Dutch farmer appears to have made a great success of the Holstein-Friesian cows; and the "Nor'-west" reports that during the official year just closed 1,545 Holstein-Friesian cows and heifers of all ages were officially tested for a period of seven consecutive days or longer, by the Holstein-Friesian Association of America, for registration in the advanced registry, and these 1,545 cows and heifers produced for the seven consecutive days a total of 581,959·5 lb. milk, containing 19,701·3 lb. butter fat; showing an average of 3·39 per cent. fat. The average weekly production for an animal so tested was 376·7 lb. milk, containing 12·75 lb. butter fat, equivalent to 53·8 lb. milk, or over 26 quarts daily, and nearly 15 lb. of the best quality of butter per week. These tests are officially conducted by the association under the personal supervision of a representative from the agricultural college or from the experiment station of the State in which the test is conducted. The issue of the official reports bring to the front Pontiac Triumph, with a record. This cow is owned by the Eastern Michigan Insane Asylum, and has always been milked by insane patients; and when a cow so milked will yield in one week enough butter fat to make nearly 25 lb. of butter, it indicates that the Holstein-Friesian cow is so level-headed herself, and so little affected by unfavourable surroundings, that she does not even require a sane milker to be able to show very large profits for her owner.—"New Zealand Farmers' Weekly."

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order MENISPERMACEÆ.

TINOSPORA, Miers.

T. Berneyi, *Bail. sp. nov.* Wyangarie yam. An extensive climber; rhizome yam or sweet potato-like. Stems cylindrical, 2 or 3 in. diameter, smooth, glabrous, more or less marked by lenticels, very irregular as to diameter, attaining the height of the tree-tops, and when its connection with the ground has been severed it sends down adventitious roots to form a fresh stem. This is not uncommon with climbing plants; indeed, H. van Rhede, in his Malabar Flora (1688), shows this feature in his figure of *Tinospora malabarica*, Mires. Leaves lanceolate, cuneate at the base, about 2 in. long and ½-in. broad a ¼-in. from the base, texture thin, 3-nerved halfway up the leaf, nerves and veins not prominent; petioles slender, about 1 in. long. Raceme or narrow panicle 4 to 5 in. long, branchlets few; pedicels thick, fleshy, about 1½ lines long under the fruit; no flowers seen. Drupes oblong, about 4 lines long, red.

Hab.: Basalt scrubs, Wyangarie, *F. L. Berney.*

Order COMPOSITÆ.

ERECHTHITES, Rafin.

E. valerianæfolia, *DC.* (Plate VIII.) A robust annual, sometimes over 6 ft. high, almost glabrous. Stems 9 lines diameter near the base, prominently ribbed. Leaves deeply lyrate-pinnatifid or pinnate; segments sharply toothed, the lower ones petiolate, 6 to 10 in. long, upper ones stalkless. Flower-heads in dense terminal corymbose panicles. Involucres about 5 lines long and 3 lines diameter at the base. Bracts about 12, shorter than the flowers, with a few outer short linear ones at the base. Achenes cylindrical, 1½ to 2 lines long, 10-ribbed. Pappus about 5 lines long, more or less stained purple. Corolla tube and limb sometimes quite white.

Hab.: Currumbin Creek, *E. T. Hancock*; Mooloolah, *C. Court* and — *Hall.* This Brazilian plant is overrunning the scrub, and likely to soon become a pest in this State, as several plants from the same country are already.

NOTE.—A few days ago Dr. F. Hamilton Kenny, of Gympie, brought under my notice a fruit, which was picked up on the beach at Masthead Island, of *Parinarium laurinum*, A. Gray, "Makita" of Fiji. How the fruit came there is not known, probably by ocean current; but when our flora is more fully known this tree may be found indigenous. The tree is also met with on the Samoan Islands.

Plate VIII.

Erechthites valerianæfolia.

Poultry.

POULTRY FATTENING.

The "American Agriculturist" tells of a method of crate-fattening chickens which is being adopted in various parts of the country.

Crate-fattening of market chickens, which has recently made substantial progress in Canada, can be carried on with profit by almost any farmer, says F. C. Elford, of the Ontario Experiment Station. The work is simple; each chicken gains in live weight 1½ lb. to 3 lb., and can be sold for a much higher price than lean chickens, because they supply, weight for weight, three times as much edible meat and of superior quality. The breast meat is the most palatable part of the chicken, hence large-framed chickens with prominent breast-bones cannot be satisfactorily fattened. The legs, largely composed of sinews, the meat of which is inferior, should form as small a proportion of the weight as practicable. Feathers on the legs are no objection, also black or dark-coloured shanks and any development of the spurs in cockerels.

The colour is secured by feeding mashes, composed mainly of ground oats and skim milk. Smallness of bone, head, and comb, and a minimum of offal, are important requirements. Plump chickens of any weight up to 5 lb. dressed, each, are more readily disposed of than large fatted chickens; 4lb. is the preferred weight. Early chickens should be marketed either as broilers, weighing 1 lb. to 1½ lb. each, or roasters, weighing 3 lb. to 4 lb. High prices are generally paid for such.

In crate-fattening, pure-bred chickens make greater gains in live weight than scrubs, and the cost of feed for 1 lb. of gain is less. At four months, the purebreds are fatted, of uniform quality and appearance, and ready for market. At no age are scrub chickens as saleable as pure-breds. The type of fowl to be selected can be had in Plymouth Rocks, Wyandottes, and Buff Orpingtons; or, if preferred, in a medium-size fancier's breed. Plymouth Rocks or Wyandottes may not be satisfactory on account of great size, heavy bone, length of leg, or narrowness of body. Hence, it is of primary importance to have a definite conception of the proper type to select. The breed is of secondary importance.

Table type fowls should conform to the following standard:—Mature weight: Cock, 7 lb. to 8½ lb.; hen, 5½ lb. to 7 lb.; shape of body, broad, blocky, and of medium length; breast, carried well forward, full and broad, and of medium depth; breast-bone, long, straight, not deep nor pointed at the front; legs set well apart, short, stout, white or yellow, without leg or foot feathering; head, medium size, comb and wattles small; plumage, close-feathered preferred; colour, not important; colour of flesh, unimportant.

To have chickens plump and well-fatted at the most profitable age, they should be placed in fattening-crates when three or four months old. This does not mean that chickens cannot be fatted profitably when more than four months old; suitable market chickens of any age will show gains. It is advisable to use fattening-crates, but, if only a small number of fowls are to be fatted, packed boxes of suitable dimensions can be adapted for the purpose.

In a series of experiments in fattening, a gain of 2⅓ lb. each was made in a total of over 350 birds of large and good breeds. The average cost for food consumed was 5¼ cents a pound of increase in live weight. The ground grain was valued at 1·20 dollars per 100 lb., and the skim milk at 15 cents per 100 lb. Oats finely ground, or with coarser hulls sifted out, should form the basis of all the grain mixtures; ground corn fed in excess results in yellow flesh of an inferior quality; ground peas impart an undesirable hardness to the flesh. Ground oats, buckwheat, barley, and low-grade flour are the most suitable meals for fattening.

Some satisfactory meal mixtures are—(1) Two parts ground oats, two parts ground buckwheat, one part ground corn; (2) equal parts ground oats, ground barley, and ground buckwheat; (3) two parts ground barley, two parts low-grade flour, one part wheat bran. The ground meal should be mixed to a thin porridge with thick, sour skim milk or buttermilk. On the average, 10 lb. of meal require from 15 lb. to 17 lb. sour skim milk. A small quantity of salt should be added to the mash. When sufficient skim milk or buttermilk cannot be obtained for mixing the mashes, a quantity of animal and raw vegetable food should be added to the fattening ration.

It is necessary to feed lightly the first week. A small quantity of the fattening food is spread along the troughs, and, as this is eaten, more food added, but not as much as the chickens would consume. The food should be given three times a day, and, after feeding, the troughs cleaned and turned over. After the first week, feeding twice a day, as much food as the birds will eat, is practised. Half an hour after feeding, the feed troughs should be cleaned and turned over. Water twice a day and grit two or three times a week should be supplied. Chickens should remain in the fattening-crates not longer than twenty-four days. Some chicks will fatten more readily than others. These should be picked out a week before finished, and a little beef tallow, shaved into the trough, given with the mash. About 1 lb. tallow to fifty or sixty chickens daily is ample. The chickens should be well dusted with sulphur to kill the lice before being placed in the crates, and again three days before being killed.

TWO THOUSAND HENS IN ONE HOUSE.

Almost all poultry books and writers in the poultry papers say that not over 40 or 50 hens can be successfully kept in one house. This involves a large amount of work. The keeping of 400 hens in that way means the care of eight or ten separate houses and a great many steps.

The "Rural New Yorker" has found a man who keeps 2,000 hens in one house, and has engaged him to describe his method. We copy his article below, but will add that in our climate a much cheaper house will answer just as well. We must take exception to his style of roosts. Being permanent, they are always in the way. A much better plan is to take your scantling, or, where they can be had, a peeled pole 3 or 4 inches in diameter, and nail short legs to it, making a bench not over 12 to 18 inches high. This answers the purpose quite as well, and can be taken out doors to burn off vermin if desirable, or moved to one side when the house is to be cleaned.

During the past year various articles purporting to describe a house for keeping 2,000 hens have appeared. The subject is of much interest to many, and we have arranged with Dr. B. Burr, of Maryland, to describe the house in which such a flock of hens is kept.

The "Burr 2,000-hen one-man house," the writer believes, is a solution of the problem of keeping poultry on a paying scale. The superstition that hens kept in flocks larger than 20 to 30 would not give as good results as the smaller flocks, giving 10 square feet of house room and 100 square feet of yard room as the smallest area compatible with good results, is absolutely false, being based entirely upon theory, while the basic law is that results are governed by the cubic feet of clean, fresh air available for each bird. While hens require warmth only during four months of the year, and during the other eight months all the active air they can get, most poultry-houses are constructed to keep them warm for twelve months. The further disadvantage of a divided house is that the conditions of light, heat, and air are not alike in any two pens. In regard to yards, "unlimited" healthy range for 1,000 hens can be had in a yard 100 feet square, provided this yard is kept ploughed and sown to green feed as often as it becomes bare. As a matter of economy in green feed and labour, three or four

yards are attached to each house—front, back, and at either end, in a single 1,000-hen house—and a continual crop of green food is produced, the growing of which keeps the yards from becoming "sick." The same sanitary care of the dirt in the house accomplishes the same ends—viz., the dirt from the lower scratching floor is thrown to the upper roosting floor, and raked out gradually with the manure, thus keeping the lower floor always sweet and clean. The straw or other litter used for scratching is changed every few weeks, and spread on the land for top-dressing.

The house is built long and narrow to give the most light and air and controllable ventilation. It is built in two storys to economise roof, cost, and labour, and ensure dry and airy sleeping quarters. The lower story front is partially enclosed with glass doors in winter to keep out rain, snow, and wind, and the house is faced a trifle to the east of south-east to give the greatest amount of sun in winter and the least in summer. Take any unused building, preferably one that can be placed in a lot and faced as above, and if your studding is long enough put in a floor, giving head room for the attendant upstairs and down. If not, raise the building high enough from the ground to make the distance from ground to plate 11 or 12 feet. Set on posts 3 feet in the ground (this is the only foundation that is rat and mouse proof), and raise the grade of ground 12 inches under house, sloping away from it.

Upstairs place a two-sash window reaching from 6 inches below the plate to the floor; every 16 feet is enough, and two on each end smaller and set higher up above roost level. Have a door in each end. Downstairs the whole front is wired in, with a wire door under each window. The ends and back are tight with a door under each window at the ends and every 8 feet on the back. Make the back doors opening alternately right and left, so that they can be partially opened in any wind when needed. Place ten nest boxes on legs 12 inches from floor on each side, and run roosts not over 5 feet long and 22 inches apart at right angles to the length of building. If the building is wide enough (over 18 feet), this gives between each set of windows a set of seven roosts on each side, with a central passage between them for cleaning and a passage on each side for egg-gathering.

The simplest roost is a piece of 2 x 2 inch, slightly rounded on the top, bored on the lower side halfway through, and set on a $\frac{5}{8}$-inch iron rod driven into the floor. If your floor beams are 22 inches from centres, this rod will drive into them through floor; if not, nail a header below floor in line of irons and bore 1 inch into header.

In front of each north window in line of roost is a trapdoor 3 feet long and the width of the space between floor beams. Running in from the north side of this opening to a support 2 feet from the lower dirt floor in the centre of building is the runway, giving the fowls free passage up and down. This is best made of siding lapped uphill to catch their feet, and, being caught below by a notch or slide, can be slid up at night. Figuring that a hen is entitled to 8 inches of roosting room, you can put in your building as many hens as your roosts will hold without fear of crowding.

The care of 2,000 hens thus housed does not take over four working hours a day, distributed as follows:—At sunrise open trapdoors, and in cold weather south windows if the day is bright. If not, do not open windows any more than they have been open all night until the sun becomes warm. Mixed grain is thrown in litter and water troughs filled. We use 10-foot galvanised 4-inch gutter set in frame 12 inches from ground, with running board 6 inches from ground, and trough covered with slanting roof to keep hens out of water. The plumber will solder in ends and hole for cork. In very cold weather a pail of hot water is put in each trough to take off the chill before cold water is put in. During the morning the hoppers are kept filled if you use the dry feeding method; if not, mash is fed at 11 o'clock; then green food given them (cabbage, rutabagas, mangels, sugar beets in cold weather, lawn clippings for

eight months in the year). At night eggs are gathered, and mixed grain thrown in litter, and after they have gone to bed the house is closed up, the windows closed in accordance with the weather, but never tight; the water troughs washed clean and left as simple and sure as the above. If you are not a born "chicken crank," avoid the business as you would the itch, for its attention to detail will drive you to drink, or, what is worse, lead you to shirk, fail, and condemn the poultry business as a financial failure, but if you enjoy the work, and get pleasure from the idiosyncracies of your hens, then start a small unit, and grow with them until you have reached your "hen-keeping" capacity.—"Florida Agriculturist."

TO TELL THE AGE OF SHEEP.

In respect of numbers, position, and arrangement of the teeth, the sheep is similar to the ox, but the periods at which the temporary or milk teeth are replaced by the permanent is quite different. There are eight incisors in the lower jaw, or, as some modern writers prefer to say, both as regards ox and sheep, six incisors and two "canines."

At birth, or before the first month has passed, the lamb is found to be in possession of six nippers or incisors, and two canines or eight incisors, as we may prefer to call them. He has also the first, second, and third molars. These serve him for the first twelve months, when the crowns of the incisors will be found to have undergone considerable wear, and to present that appearance of being too far apart and too small for the mouth of the animal, which is such a conspicuous feature in cattle nine months or so later.

At a year and three months the same change takes place which has been noted six months later in cattle of the improved breeds—namely, the shedding of the two central molars makes way for the first two permanent ones. At twenty-one, or more often twenty-two, months, the next pair, one on either side of the first pair, appear, displacing the milk teeth.

The next pair come up in from two to five months after the second pair—that is to say, at from 22 months to two years and three months; and at three years the last pair of corner incisors or "canines" put in an appearance. In judging the age of sheep in the general way, the presence or otherwise of the permanent incisor teeth is enough to determine the age, but for shows, and where it is important to be exact and have all the evidence possible, we must, as in the case of cattle, consult the grinders as well.

The first permanent molars make their appearance at about three months; they are the fourth numerically, counting from the front backwards. At nine months the second permanent molars appear, and occupy the position immediately behind the first—that is to say, numerically, the fifth (there being still three temporary ones in front of these permanent teeth). The last permanent molars come into sight at about 18 months, and occupy the position farthest from the front. It should be understood that they are not the last teeth to cut, as are the wisdom teeth, farthest back in the human mouth. At 22 months the first and second temporary molars in each side, both in the upper and lower jaw, are replaced, and, finally, at about two years, the last of all the temporary grinding teeth is shed—namely, the third molar, which has kept its place and done service while all the others were being replaced. At two years, then, the sheep has 24 grinders, and, if of an improved breed and well kept and developed, it will have six out of the eight incisors.

The permanent teeth are both larger and darker in colour than the milk teeth or temporary ones.

The changes in the appearance of the teeth of the sheep are the same as those in cattle. The important matter to bear in mind is the difference of time at which the changes take place.—"Farm, Field, and Fireside."

Apiculture.

AN AUSTRALIAN BEE LICENSE, PERMITTING THE EXCLUSIVE USE OF BEE PASTURAGE.

Through the efforts of the Apiarists' Association in the State of Victoria, there has been in force since 1st March, 1906, a law regulating the beekeeping industry on State-owned lands. Provision is made in two ways in the interests of apiarists—by bee-site licenses and bee-range licenses. A beekeeper may, on payment of 2s. 6d. a year, obtain the right to occupy one or more acres of ground as a site for an apiary on any forest reserve, any other Crown lands, or any State-owned lands leased to pastoral tenants. This bee-site license gives the apiarist legal occupation, and if there is not likely to be any competition of other apiarists it is all he needs. If he wishes to have the exclusive use of the bee pasture, he may apply for a bee-range license. This license covers a distance of 1 mile in every direction, and the annual payment is ½d. for every acre included in this radius, and no other bee-site license or bee-range license is there issued by the Government at a less distance than 2 miles. If any pastoral tenant of the State intends to ringbark any trees, he is compelled to give notice of his intention to any beekeeper within 2 miles, so that such beekeeper may appeal or protest against the proposed destruction of honey-producing flora at a land board. To prevent monopolies, the number of bee-sites or bee-ranges which may be granted to any one person or company is three. Beekeepers whose apiaries are on privately-owned lands adjoining State lands may also take out bee-range licenses.—"New Zealand Farmers' Weekly."

ORANGE WINE.

With the approach of the orange harvest, the usual requests reach us from correspondents wishing to know how to make orange wine. We have already given some good recipes for making this beverage, but here is one we take from the Natal "Agricultural Journal," by one who every year makes this wine, and who finds a ready sale for it at 15s. per dozen:—

Cask of Orange Wine (30 gallon cask).—1,200 oranges at 1s. per 100, 12s.; 120 lb. of sugar, £1 5s. Skin the oranges and press the juice out. Soak the pulp in water for seven days, and frequently stir and press. Add the extract to the juice, pour the mixture into the cask. Pour boiling water on the sugar until all is reduced to a syrup, when it is added to the cask, and the vacant space is filled with hot water. When the temperature is lukewarm, add a little yeast, and at the expiration of three weeks fermentation should be finished. During the three weeks of fermentation liquor must be added to the cask so that it remains full, for a quantity of sediment will bubble over. When there are no more bubbles, 2 ounces of isinglass should be dissolved in some of the warmed liquor and added to the cask. The bung may now be fastened down. The tap is put in 2 inches from the bottom of the front head. At the end of a month the contents should be ready for drawing off. The cost will be 1s. 3d. per gallon, or 2½d. per reputed quart bottle, and the drink will be in great request. If the liquor is to be kept for any length of time, 1 ounce of salicylic acid should be added at the same time as the isinglass. The salicylic acid will act as a preservative, and prevent the liquor turning sour; but the best means of preserving the contents is to keep the cask full.

Tropical Industries.

TOBACCO CULTIVATION.

By R. S. NEVILL.

The importance of the thorough preparation of the soil for tobacco, and the thorough cultivation of the crop in the field, cannot be too strongly impressed upon the grower. Tobacco is a profitable and valuable crop, and it should be the aim of every grower to use every means available to get the best results, which means always a market and the best prices.

That the crop will grow and thrive in badly prepared ground, under favourable weather conditions, is true, but where the soil is thoroughly worked down and pulverised the quality of the product is much improved, as there seems to be something required by the plant, that is supplied by the soil, that is not to be obtained in sufficient quantities in coarse and badly prepared land. This has not only been demonstrated by experiments, but is further shown by the known fact that the best tobacco lands of all countries are those capable of the finest tilth. In this country, where seasonable rains do not always come at the desired time, the crop set in the well-prepared soil will be found to suffer least from the droughty conditions that may prevail at a critical time, for the reason it will retain the moisture better than the soil that has not been well prepared.

Land intended for this crop should always be well and deeply ploughed and cross ploughed; the first ploughing should be done in the early fall in those districts that grow the pipe tobaccos. The soil will get the benefit of the frosts, which greatly tends to improve its mechanical condition, and in all districts it will prevent the seeding of weeds. Many insect pests are thus destroyed by the winter rains, and these rains are more readily absorbed and retained when the ground has been ploughed. After the second ploughing or third, which is sometimes necessary when the spring has been wet, the harrowing should be thorough, until the soil is reduced to the finest possible tilth.

CULTIVATION.

No plant responds more quickly to thorough cultivation than tobacco, and probably none are more improved by it in character and quality.

The field should be kept clean and in good tilth, to promote a rapid and healthful growth. This cultivation creates a dust mulch that conserves the moisture in the soil; it allows the air to penetrate it, releases any harmful gases that may have accumulated there, keeps down weeds, and destroys the hiding places of insects. This cultivation should be frequent, and commence after the first hoeing, and continue at least every ten days, until the tobacco is too large for the horse to pass between the rows without injury to the plant.

For this work a short single-tree should be used. In the pipe varieties, the plants should be so set as to allow cultivation both ways. The first cultivation should be deep and close to the plants before many roots have been formed, and for this a double shovel plough is the best, breaking the middle well out. This leaves the ground in good condition for the roots to spread, and gives the plant the full benefit of an ample feeding surface and no dwarfed roots.

After this, frequent and shallow cultivation is desirable with the Planet for working the soil gradually towards the plant. By this gradual working the soil towards the plant, you do not create a large evaporating surface before the ground is well shaded by the plant. This is essential in this State, where the hot sun and winds cause rapid evaporation.

COST OF GROWING COTTON IN ST. KITT'S.

A series of experiments was carried out with cotton at the La Guerite Experiment Station, St. Kitt's, during the year 1905-6. This series included trials of the effect of manures and of different varieties; efforts were also made to ascertain the best season for planting cotton and the most satisfactory distance at which it should be planted. These experiments covered an area of 5 acres.

In the Annual Report on the Botanic Station and Economic Experiments for 1905-6, Mr. F. R. Shepherd gives the actual cost of growing cotton in these experiments as follows:—

	£	s.	d.
Cost of banking land, at 16s. per acre	4	0	0
„ seed, at 1s. 1d. per acre	0	5	5
„ planting, at 1s. 6d. per acre	0	7	6
„ supplying, at 6d. per acre	0	2	6
„ weeding, at 13s. per acre	3	5	0
„ sulphur	0	4	0
„ Paris green	1	1	0
„ lime	0	5	6
„ applying insecticides	0	17	10
Total cost to time of picking	£10	8	9
Cost of picking and cleaning 5,002 lb. cotton at 1 c. per lb. ...	10	9	5
„ ginning 1,352 lb. lint, at $2\frac{1}{2}$ c.	7	0	10
„ shipping 1,352 lb. lint, at 1·5 c.	4	4	6
„ 48 bags for stowing cotton, at 16 c.	1	12	0
„ manures for experiment	4	0	0
Total cost on 5 acres	£37	15	6
Proceeds—			
807 lb. lint, at 16d. per lb.	58	16	0
213 „ $16\frac{1}{2}$d. per lb.	14	11	10
176 „ $15\frac{1}{2}$d. per lb.	11	7	4
156 „ 18d. per lb.	11	14	0
1,342 „	£91	9	2
3,650 „ cotton seed, at 1 c. per lb.	7	12	1
Total proceeds from 5 acres	£99	1	3
Less expenses as above	37	15	6
Net profit	£61	5	9

Further "check" experiments were made as to distance planting, which resulted as shown below:—

Plot (A)	4 feet by 3 feet ...	$28\frac{1}{2}$ lb. of seed cotton.
Plot (B)	4 feet by $2\frac{1}{2}$ feet ...	$29\frac{1}{2}$ lb. of seed cotton.
Plot (C)	4 feet by 2 feet ...	$27\frac{1}{2}$ lb. of seed cotton.
Plot (D)	4 feet by $1\frac{1}{2}$ feet ...	$35\frac{1}{2}$ lb. of seed cotton.
Total	...	121 lb., or 1,210 lb. per acre.

This is quite a remarkable yield, considering that the average, over nearly 1,000 acres of neighbouring land, has certainly been less than 200 lb. of seed cotton per acre. It may be interesting and instructive to record that this cotton had no less than nine dustings with sulphur and lime for the leaf-blister mite, and three separate pickings of all infected leaves from the plants, but it was

deemed best in the end to destroy the plants before any second blossoming had appeared.

The general result of these experiments goes to show that to plant 20 inches apart in the rows is the best. In every instance, the outside plots gave a relatively larger yield than the inside. Five feet between the rows is recommended in preference to 4 feet.

THE EGYPTIAN COTTON WORM.

Enormous losses are sustained in Egypt owing to the ravages of insect pests, and this is mainly owing to the carelessness of the native cultivator in keeping his crops clean, and in so suitable a climate for the propagation of insect pests, the absence of a complete resting stage, and an almost continuous succession of broods, the working of insect life is such that it is not until a pest has obtained a firm hold on cultivation that the evil is brought to light. On this subject the "Ceylon Tropical Agriculturist" has a very instructive article taken from the "Egyptian Gazette," which should be carefully considered by cotton-growers in Queensland. Fortunately, the cotton pests in this State are very few, the cotton boll worm being practically the only one which occasionally causes trouble; but, on the whole, it may be said that there is no pest here which need deter anyone from prosecuting the profitable industry of cotton-growing.

The "Egyptian Gazette" says:—

From practical observation in the field, there is considerably more cotton worm in the country than is generally supposed, and the pest having once reached a certain stage human agency can do little more than act as a check, it being almost impossible to entirely exterminate it. A natural method, acting in co-operation with the system at present employed, is therefore required to further the success of this important work. The occurrence of insect pests on cotton can invariably be traced to unnatural methods of cultivation, such as late and heavy sowing, which produces weak plants and small crops; overcrowding and overwatering, which provide abundance of food and conditions favourable to pests, by producing rank, succulent, shady growth, fatal to the lower bolls and the early first picking of cotton. The deteriorating effect of fertilisation by inferior varieties has also to be considered. The practical agriculturist has only to look at the strong useless wood and rank foliage produced by the average crop, and to consider the strain on the land and the valuable time wasted in its production, to understand that the application of quick-acting manures under the present cultural conditions would in many cases only hasten disaster by over-stimulating the plants. Moreover, the folly of utilising the unique cotton-producing characteristics of this climate and soil for producing useless wood and foliage is apparent from the yield of last year's crop.

Cotton cultivated under a suitable method by the writer, Walter Draper, F.L.S., and proved by a series of practical experiments, presented the following appearance:—

Healthy, bushy plants covered with flowers. Red-ripe wood. Foliage slightly yellow in colour. One and two bolls at the base of each leaf. Flowers well above the terminal shoot. The lower branches on the ground with bolls.

Sun and air to reach all parts of the plants. Instead of which, one finds large areas of over-watered cotton with soft green and unripe wood, dark, rank foliage, few flowers, and the early bolls at the base of the plant shaded, of an unhealthy yellow colour, and falling from the absence of light and air. Still larger is the area of small, weak plants, caused by late planting, from which it is hopeless to expect a full crop.

Should further proof be required for the necessity of reform in the cotton cultivation of Egypt, it can be found in the very large number of unripe bolls to be seen on the stacks of dry cotton stalks everywhere.

The natural methods of agricultural reform in cotton cultivation, strong in their simplicity, may probably be entered into in time for next season's crop. The object of the writer is merely to endeavour to show how the work of checking *Prodenia littoralis* can be assisted by Nature, rather than by reform in cultivation, although they both work hand in hand.

A Natural Method of Prevention.

Dryness prevents the deposit of the egg-nidus by the female moth. Heat and dryness combined are fatal to the young cotton worms. The production of rank, succulent foliage and shade by overwatering has been mentioned; because it is not only detrimental to the yield of a full crop, but also to show that it produces abundance of food for cotton pest in the form of chlorophyll or sap in the cells between the upper and lower epidermis or skin of the leaf. This green-coloured fluid is essential to the life of the cotton worm, especially in the early stage of the hatching; moreover, on such cotton foliage only are eggs deposited by the female moth.

The polyphagous habit of the moth is such that in August eggs are deposited on the leaves of lebbek pear, plum, *Aristolochia fici*, &c. Much remains to be learnt of the natural habits of cotton pests, which in the field differ considerably from those in captivity.

Egg Deposits.

One important point has been proved—viz., that the first great deposits of eggs on the cotton plants occur between the 15th of June and the 15th of July, the 20th of June to the 10th of July being the most critical period. Although the pest is somewhat gregarious, the female moth prefers to deposit her eggs on cotton a day or two after the irrigation of an area. The eggs hatch in about three days. They are not all deposited at one time; thus the age and size of the worms of this brood are very irregular. The writer has proved by experiments that early sown, naturally grown cotton on average land will stand from 30 to 40 days without water, and with excellent results in ripening the wood and producing an unusually heavy crop, but on light sandy soils this period would probably require some slight modification.

From the foregoing remarks it will be seen that cotton which can be kept dry during the egg-laying period is free from egg deposits. Although it would scarcely be possible to apply this method at one time throughout the whole area of infected country, the irrigation of certain districts, by the present system of rotations, creates suitable places or traps for the moth to deposit her eggs. By carefully following up these rotations, the cost of labour would be considerably minimised, and the valuable time now spent in searching unlikely places might be devoted to the more thorough cleaning of egg deposits on traps formed by newly-irrigated cotton areas.

Exterminating Young Worms by Heat and Dryness.

The worms, after hatching on the leaf, lower themselves to the ground by means of a web-like thread, and remain for a time under the soil of the ridges, feeding (during the first stage of their existence) chiefly at night on the lower leaves. It is obvious from their various ages that several pickings of worms are thus necessary to clear an infected area. In this it is impossible to prevent escapes, however carefully the work is done. Propagation from this source alone is capable of much damage, and the complete extermination of this brood by a natural method is, therefore, extremely important.

The crux of the question of the extermination of cotton pests by the assistance of Nature, or at least the first stepping-stone to this object, is to counteract unnatural conditions of shade and dampness by dryness and heat. The successful application of this method can only be learnt by continuous observation in the field. It has been proved by experiment that the heat of the mid-day sun on the surface soil of unshaded ridges is often 120 degrees to 130 degrees Fahr. Cotton, if allowed to flag from dryness, contains no food in its foliage for the young larvæ. It enables the sun to reach the ridges, which is fatal to the existence of the worms and fungoid disease. The production of rank foliage is checked by the stoppage in the flow of sap. The green, succulent wood ripens, and produces abundance of flowers and lint, and the quality and quantity of the crop yield are considerably augmented.

When once this natural method (which applies only to cotton controlled by irrigation) has become known, and success more universally established, native growers will see the advantage of taking the matter up. Reform will naturally be slow, but the gain to the country would be enormous. The following are some of the chief pests known to attack cotton cultivated in Egypt:—

(1) *Prodenia littoralis.*—(The Egyptian Cotton Worm.) Feeds on rank foliage caused by overwatering, &c.

(2) *Earias insulana.*—(The Egyptian Boll Worm.) Feeds on unripe bolls of a late feeble crop, caused by unnatural conditions of cultivation.

(3) *Aphis sp.*—(The Cotton Blight) produces on succulent foliage a black fungus known as "Nedwet-el Assal."

(4) *Opogona grossipella.*—(The Small Boll Worm) lately discovered by the writer.

(5) *Agrotis Ypsilon.*—(The Cotton Cut Worm.)

(6) *Laphygma exigua.*—(The Green Cotton Worm.)

(7) *Oxycarenus halinpennis.*—(The Cotton Stainer.) A plant-bug which sucks the sap of the cotton and lives in the unripe bolls during winter.

(8) *A Root Fungus ?.*—At present under observation. Appears only in July, caused by overwatering.

(9) *A Species of Red Spider.*—Migrates from berseem to cotton in May. Sucks the chlorophyll from the leaves of the cotton plant. The late sowing of cotton in the northern portion of the Delta could be obviated and the young plants protected from the early cold and hot winds by the planting of suitable clumps of trees to act as wind screens. This would also prove of great assistance to the bean crop when in flower and prevent considerable crop loss.

A PROFITABLE CROP.

R. S. NEVILL.

"The Western Tobacco Journal" says during the forty-six years they have been growing cigar tobacco in Lancaster County, Pennsylvania, that the crop has brought into the county £16,000,000 sterling. That it is a wonderful sum, but that it is correct. This is a yearly average of £23 7s. per acre.

When it is considered that there must have been several bad crop years within this period, when the yield was light, and some where there was probably a failure, and the low market value of some years when stocks were heavy or from other causes, it will be seen at once what a profitable crop it has proven to be, to have reached this good average through all these forty-six years.

A NEW RUBBER VINE.

The owner of a Mexican cacao plantation says he has discovered on his property a rubber vine that excels all others.

The Chinese labourers in his employ gathered vines and wove them into rude hammocks. The hammocks were especially elastic on account of the large amount of rubber in them. This was particularly so if the vines were dried some time, and was the cause of the popularity of the hammocks with the Chinese.

The attention of the owner of the hacienda was naturally called to the peculiar properties of the strange vine. Upon investigation it was found to carry a high percentage of rubber, amounting to about 20 or 25 per cent. of the weight of the vine, and so strong that on breaking the wood the rubber still holds.

In the new vine there appears to be a total absence of essential oil and rosin. It is not so certain a fact, however, that this property will add to the facility of extraction. It may make it more difficult. If it shall be found that it is possible to separate this new rubber from the plant in any economical manner, the discoverer believes that the percentage of rubber is higher than in any other known plant.—"Modern Mexico."

THE CRUELTY OF JERKING THE REINS.

Pulling violently, and especially jerking the reins, is a too common practice with cabmen and drivers of horses, and, as they probably do it more out of ignorance than sheer brutality or spite, it is well they should know that the practice is a most harmful as well as painful one, both as regards the temper and the physical structure of the horse. A French expert, Baron Henry d'Anchald, has published the results of his observations on the painful effects of the practice of jerking the reins. "We are apt to forget," he writes, "that this mouth, which serves as the medium of communication between us and the animal, should never be subjected to rough treatment or shock if it is to remain sensitive and beautiful, as it undoubtedly is; that this mouth becomes bewildered and uncertain, so to speak, and hard under stupid or violent treatment, the jerking of the reins rendering the animal indocile, sullen, and stubborn."

The details of M. d'Anchald's experiments we have no space to go into here, but, to appreciate more nearly the intensity of the pain caused by the jerking of the reins, it need only be remembered that the cannon of the bit, which is more or less thick and round, rests upon but a very small part of a membrane, which is delicate, very nervous, and is itself the envelope of a tolerably trenchant bone. If one can imagine, therefore, the effect of a 33 lb. weight (so M. d'Anchald calculates the pressure) falling on one's toes from a height of, say, 15 to 20 inches, one realises to some extent the pain which is inflicted on an unfortunate horse by this always brutal jerking of the reins. Not only is jerking the reins useless in itself, but it is also most harmful, especially to young horses, as it compromises their future value and usefulness. In addition to that, the pain caused by it involves a loss of energy and fatigue, which soon uses up the animal. A flick of the whip applied to the hindquarters, or the withers, for example, should be all that is needed to stimulate the horse to fresh exertion.—"Garden and Field."

[This brutal practice is only too common in this State, and it is regrettable to note that female drivers of drays and spring carts are the chief offenders, although they would not use a whip because they think it cruel. Rein-jerking is far more cruel, and should be included in the cruelty to animals law.—Ed. "Q.A.J."]

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1905.	1906.											
	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
North.													
Bowen	0·04	12·84	8·73	6·29	0·78	6·34	0·69	0·04	0·36	3·41	1·76	0·99	11·01
Cairns	0·53	7·00	16·87	16·05	5·20	4·04	3·44	2·28	1·79	1·57	0·56	13·26	11·31
Geraldton	1·14	15·61	37·67	19·67	11·51	7·93	16·05	5·73	6·65	4·26	2·28	21·08	*20·51
Herberton	0·51	15·20	3·73	4·67	1·25	1·38	1·04	0·59	0·55	0·38	0·30	5·16	10·82
Hughenden	0·14	6·11	3·93	8·47	0·12	Nil	Nil	Nil	Nil	0·92	0·61	0·51	†3·76
Kamerunga	0·33	7·25	13·76	14·93	4·94	4·13	3·55	2·49	2·03	2·56	0·72	10·00	8·17
Longreach	0·17	3·99	8·61	12·25	Nil	0·22	Nil	0·11	Nil	4·11	2·16	0·66	0·51
Lucinda	0·95	10·13	49·97	25·88	10·12	3·77	3·02	0·40	...	Nil	1·85	6·60	*22·36
Mackay	0·70	13·58	9·88	16 57	2·87	11·87	3·85	0·68	0·93	4·35	2·63	1·80	12·93
Rockhampton	4·77	4·24	15·31	8·26	Nil	5·27	1·12	Nil	2·61	3·80	1·07	0·46	5·19
Townsville	Nil	10·05	17·31	4·28	0·38	1·80	0·30	Nil	0·46	3·25	1·45	7·74	14·03
South.													
Barcaldine	1·30	4·00	7·07	13·84	Nil	1·70	0·19	0·10	Nil	2·88	2·92	1·33	1·04
Beenleigh	3·77	4·96	15·11	9·34	0·04	3·57	1·47	0·16	2·94	3·47	2·94	1·75	3·98
Biggenden	11·66	2·27	8·24	4·61	0·45	5·77	1·42	0·48	3·02	5·07	1·19	3·09	†4·55
Blackall	0·83	5·13	11·14	11·99	Nil	1·75	0·22	0·48	0·02	4·70	5·86	1·37	1·96
Brisbane	8·21	4·16	12·71	4·85	0·45	3·23	1·38	0·22	4·21	3·48	3·81	1·07	3·28
Bundaberg	6·74	6·92	9·92	1·90	1·17	8·44	2·01	0·03	1·86	10·90	1·57	0·97	3·85
Caboolture	6·72	8·11	12·73	6·46	0·49	4·53	0·85	0·29	3·02	4·77	4·73	4·26	3·15
Charleville	0·12	1·29	10·66	3·15	0·07	...	0·13	2·34	0·35	4·99	2·66	1·30	3·71
Dalby	5·67	4·15	4·43	5·15	1·81	0·66	0·87	1·58	2·78	2·65	2·96	2·12	5·67
Emerald	0·80	6·12	7·81	5·22	0·08	2·12	0·17	Nil	1·62	4·47	1·55	2·32	1·79
Esk	5·98	5·49	6·79	9·04	1·74	3·25	0·77	0·38	4·51	4·14	2·90	2·45	5·26
Gatton College ...	4·73	3·75	5·33	9·43	1·40	1·90	0·60	0·41	3·73	3·54	2·25	2·01	3·45
Gayndah	5·58	2·81	9·65	5·86	0·51	5·10	0·48	0·22	2·34	5·14	2·25	4·25	2·82
Gindie	Nil	1·92	9·15	5·92	Nil	2·32	0·05	Nil	1·46	4·57	3·20	2·95	1·45
Goondiwindi	2·72	1·08	2·60	2·19	0·37	2·80	0·98	0·49	4·35	3·33	2·36	2·32	4·04
Gympie	5·03	6·07	7·38	5·58	0·45	6·88	2·26	0·52	3·19	3·97	3·03	4·12	5·32
Ipswich	3·64	5·30	7·22	3·87	0·12	1·67	0·25	0·17	2·59	2·94	2·60	0·71	4·22
Laidley	3·73	3·29	5·63	6·73	0·35	2·83	0·49	0·50	3·26	3·19	2·87	1·78	4·12
Maryborough	4·03	4·46	8·34	6·77	1·08	4·85	2·55	0·15	2·31	6·48	1·22	2·49	4·39
Nambour	5·37	7·01	16·50	9·35	1·13	6·20	3 68	0·61	4·52	8·94	4·89	3·40	6·74
Nerang	5·14	5·01	13·68	10·04	0 87	10·32	1·98	0·12	3·56	6·42	8·26	2·75	6·33
Roma	2·62	2·18	12·95	3·94	Nil	1·09	1·08	1·65	1·47	4·43	2·37	1·32	4·31
Stanthorpe	4·43	6·06	2·76	3·18	2·00	0·77	0·45	1·44	3·37	4·29	2·90	2·49	4·89
Tambo	0·39	5·09	9·05	10·63	Nil	0·66	0·05	0·67	0·07	5·17	2·85	1·23	1·16
Taroom	2·52	1·86	13·73	6·02	0·23	1·04	0·81	0·60	2·30	4·26	1·70	1·35	5·49
Tewantin	6·64	12·07	18·59	7·57	2·27	4·61	5·68	0·39	4·25	6·37	4·38	2·73	*9·53
Texas	4·54	3·41	2·11	1·94	1·89	1·57	0·75	0·90	3·22	2·77	3·42	2·23	1·83
Toowoomba	3·20	6·17	6·58	8·87	2·07	2·65	0·85	1·81	3·63	4·55	2·76	2·65	4·11
Warwick	3·98	2·09	2·21	6·27	0·37	0·77	0·57	1·16	3·85	3·13	2·47	2·99	5·50
Westbrook	2·39	5·00	4·01	5·12	0·93	0·50	0·55	1·67	2·80	3·34	3·41	‡	1·48

* Compiled from telegraphic reports. † Approximate—subject to alteration. ‡ Return not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

General Notes.

A CURE FOR SNAKE-BITE.

During the present summer snakes have been far more numerous in some parts of the State than for several years past. Fortunately, few people have been bitten, and a fatal bite is most unusual. Still it is well to be prepared for an accident, especially when it occurs far away from medical assistance. Hundreds of Australians are camping out every night in the bush, often in districts infested by that dangerous reptile, the death-adder, or in low lands, the haunt of the deadly black snake. Innumerable are the stories, authentic in most cases, of snakes having shared the blankets during the night with a tired-out traveller. We ourselves once spent an unpleasant half-hour with a tiger snake in our tent on the Newcastle Range, near Georgetown. Under these circumstances, travellers should always carry some possible remedy with them. The vinegar cure mentioned in this Journal some time ago is good, but vinegar is bulky to carry, and often unprocurable in the bush. A hypodermic syringe is the last thing the ordinary bushman would invest in. Outside these, a lump of alum is cheap, portable, and said to be an excellent antidote to snake-bite, if taken internally. We now have a reputed antidote published in the "Florida Agriculturist" by Dr. E. F. Brown, a medical man who has been practising in Lake City, Florida, for thirty-five years, and this is what he says:—

"I consider tincture of iodine a specific in all cases of snake-bite. My method is to apply the tincture to the wound, undiluted, and put 10 or 15 drops into a glass, adding 1 teaspoonful of water for each drop of tincture, and give the patient 1 teaspoonful of the mixture every 10 minutes until the pain begins to grow less severe; then every half-hour, or hour, as the case seems to require, and continue this treatment as long as seems necessary.

"If the bite is a very bad one, I would double the quantity.

"About fifteen years ago I was called to treat a dangerous case of snake-bite, where the whisky remedy had been faithfully tried and failed, and the patient was terribly swollen and appeared near dying, so I gave the iodine in 1-drop doses every 5 minutes, and was gratified to see a prompt, rapid recovery. In 12 hours the patient was able to resume her household work, and suffered no further inconvenience from the snake-bite."

Another case the doctor mentions is that of a white ploughboy, who was bitten by a ground rattler. The rattlesnake is one of the most venomous snakes in the United States; very numerous in the Rocky Mountains. He did not see the lad until three or four hours after he was bitten. It was too late to make an outward application, so he put 10 drops of iodine tincture into 10 teaspoonfuls of water, and gave him a teaspoonful of the mixture every 5 minutes for a few times, then lengthened the time to half an hour, giving in all about 20 drops, and the next morning he resumed his ploughing with no inconvenience.

Another case was that of a dog which was bitten by a monstrous rattlesnake, and was thought to be dying, but the doctor gave him tincture of iodine in 5 or 6 drop doses, and in 6 hours the dog went out cow-hunting with his master. With respect to domestic animals, he says:—

"If I had a horse, mule, or cow bitten by a rattlesnake or moccasin, I would draw out the tongue and drop on it about half a teaspoonful of iodine, and repeat the dose every half-hour, or oftener if the case seemed desperate,

until I saw improvement, then every hour or two hours until I dismissed the case, which would be in 10 or 12 hours from beginning of treatment. This without doubt would save the animal's life, and with no suppuration or other after results."

We give this remedy as one amongst the many we have heard of. It is simple and cheap, and, at all events, as worthy of a trial as dosing the person bitten with brandy or other spirits. The latter treatment has frequently resulted in the death of a patient from fright and overdoses of spirit, especially when bitten by a non-venomous snake. We would in any case advise those whose work lies in snake-infested country, or in sugar-cane fields, where snakes are frequently found, to carry a piece of alum and a bottle of iodine. These remedies may possibly save life, or at least prolong it, until medical assistance can be obtained.

THE DEATH (OR DEAF) ADDER.

It is generally believed that the bite of a death-adder is incurable, that death must inevitably ensue from the bite. Mr. Donald Mackay, of Kenmore, however, gives an instance of recovery from a bite from this reptile, made by a mongrel fox-terrier pup. A terrier slut and this pup had put up a young adder 15 inches long, and the slut was bitten on the nose. There seemed to be no mark of a bite on the pup. Fluid ammonia was used on the slut, externally and internally. Next morning she was still alive, and the pup also was very sick. Both lingered on for two days, but then rapidly recovered, and both dogs are quite well. No remedy at all was used for the puppy. Mr. Mackay naturally asks the reason for these recoveries. We cannot tell, but we know of a case where a child was bitten by a large deaf-adder. Remedies were promptly applied, and the child soon recovered. In this case the bite was more of the nature of a long scratch, so probably the poison had no chance to circulate through the system. With respect to the case of fascination by a snake, which our correspondent hesitates to give as "it shows credulity," we should be glad if he would overcome his diffidence and give us the particulars.

COLD STORAGE AS A FACTOR IN THE SPREAD OF INSECT PESTS.

Mr. Claude Fuller, Government Entomologist, Natal, writing to the Agricultural Journal of that colony, says:—

As evidence of the possibilities of spreading of insect pests by the exchange of fruits between one country and another in cold storage, the following record is of some importance:—

Upon the 9th of February, 1906, a quantity of apparently sound peaches were stored in the Government Cold Stores, Pietermaritzburg, the temperature being kept at 40 degrees Fahr.; and, if varying at all, only between 39 degrees and 40 degrees Fahr. These peaches were originally intended for shipment to London, but, in overhauling them, some were found to be infested with fruit-fly maggots. Consequently, it was decided not to forward them, and they were retained in the store with the view of observing the general effect of cold storage over an extended period. Later, the peaches having generally deteriorated, it was decided to remove them from the stores. All along it was recognised that the maggots, though torpid, were still alive. Through an oversight, one of the employees discarded the whole lot, instead of retaining those containing maggots, as arranged, for my further investigation. Happily enough, some one-half to three-quarters of an hour after the fruit was removed from the cold room, it was examined by the manager, Mr. Grey, who had previously been interested in the progress of the maggots. He then found that some had become quite active. This occurred on the 12th June. Therefore, the maggots had remained alive in a more or less torpid condition for 124 days.

SHIPMENTS OF YUCATAN (SISAL) HEMP.

The following statistics will afford growers of sisal fibre in Queensland some idea of the expansion of the industry in Mexico:—

During the month of September there were received at Progreso by rail 42,312 bales of hemp, and by sea from Campeche, during the same month, 885 bales. During September there were shipped from Progreso a total of 58,843 bales, which left at that port on 30th September, 1906, 63,044 bales of hemp.

There were sent to Boston, during September, 26,717 bales; to New Orleans, 11,843 bales; to Mobile, 7,175 bales; to New York, 6,758 bales; and to Galveston, 4,600 bales; making a total of 57,093 bales shipped to the United States. Of the balance of the shipments from Progreso, 1,500 bales were sent to Montreal and 250 bales to Havana.

A comparative statement for the past three years, published in the Bulletin, shows that in September, 1904, there were shipped from Progreso 34,937 bales of hemp, at an average price of 30 cents per kilo; in September, 1905, the shipments from Progreso were 45,453 bales, at an average price of 31 cents per kilo; while, during last September, the 58,843 bales shipped from the port brought an average price of 27 cents per kilo. (1 cent = $\frac{1}{2}$d.; 1 kilo = $2\frac{1}{5}$ lb.)

THE TIGER AS THE FRIEND OF MAN.

The "Straits Times" has the following veracious little story:—"An ingenious Scotchman, who manages a rubber plantation in full yield, but is short of labourers, is said to have supplied the deficiency by a neat device. He impregnates the trunks of the Hevea trees with valerian; like common cats, the tigers, who are fond of the perfume, with which the bark is impregnated, come and rub themselves against it, and in their voluptuous ecstacy, they tear the trunks with their claws. All that is then needed is to send a few coolies on the following day to gather the latex which has coagulated around the wounds in the bark."

POTASIMITE, THE NEW EXPLOSIVE.

Potasimite, the new explosive which is attracting the attention of all the people in this Republic interested in explosives, notably the miners of the country, appears destined to supersede dynamite very largely in the near future.

Very recently the Mexican Government had five most satisfactory tests of this new explosive made in the neighbourhood of Monterrey, where it is being manufactured. Among the claims made for potasimite are that it is far cheaper, that its effect is more penetrating than any other explosive, and that much time can be saved in handling it; also, that it leaves in its wake no poisonous gases to prevent the immediate return of the miners to the scene of explosion. The inventor of potasimite is not known by name, the only thing known in this connection being that Dr. Melesio Martinez, of Monterrey, is at the head of the company. It is claimed, however, that the new explosive is strictly a Mexican invention. If this is the case, and it accomplishes the results expected and displaces dynamite, it will be a source of great pride to Mexicans.

It is expected that the cost of mining operations will be very materially reduced by the use of potasimite, and that within a year or two after the demonstrations of its success it will be in general use throughout the world.—"Mexican Investor."

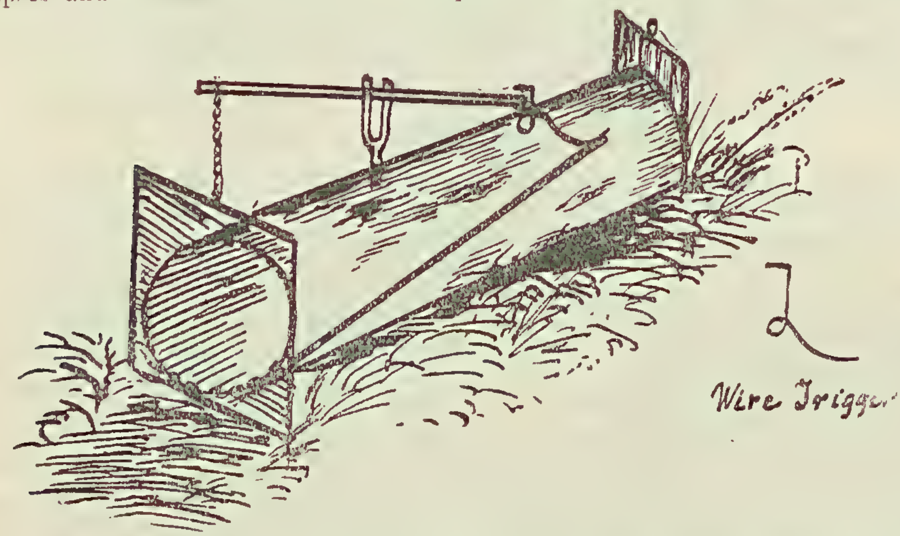
HOW TO KEEP CUT FLOWERS.

There are flowers which will last a considerable time when cut and placed in a vase of water. Again, there are some of the most beautiful blooms which fade away within 24 hours. Various means have been suggested for the preservation of cut flowers, amongst which "Garden and Field" recommends taking

the flowers every morning from the vases, refreshing the stems by a few minutes' bathing in fresh water, and then sprinkling the blooms lightly with the hand. The watêr is to be changed every day. Sunshine is very injurious if allowed to rest on cut flowers, and gas saps the very life of delicate blossoms. If flowers are cut before the sun can stare them out of countenance and placed in tepid water, they will last for 48 hours. Nasturtiums, heliotrope, and, above all, roses, should be gathered at night, if possible. Their stems, and those of all flowers kept in water, should be cut daily. The wistaria is a beautiful but perishable blossom that seems to pine away when transferred to the house (the jacaranda does the same.—Ed. "Q.A.J."), but the Japanese have conquered this propensity by the most heroic treatment. They burn the stems of the graceful creeper, and then immerse it in spirits. Other woody plants like the hydrangea, branches of fruit blossoms, &c., can be treated in the same way.

A BANDICOOT TRAP.

Mr. E. J. Watton, Murray's Creek, sends us a description of the bandicoot trap we illustrate below. Of the making of traps and "sprynges" there is no end, but, like bunny in the West, the bandicoot laughs at all attempts to keep him in subjection. Have any of our readers ever tasted roast, boiled, or stewed bandicoot? If not, catch one and try it. The flesh is delicately white and tender, and the flavour somewhat like that of a sucking pig. For cooking purposes the animal must be plucked, not skinned. A fair-sized bandicoot will make a good meal for four persons. These animals live entirely on grain and roots, and are consequently "clean" game. The trap here shown is apparently a modification of the rabbit trap exhibited at the last Exhibition at Bowen Park. It has the same false floor, which, on the entrance of the animal, collapses and releases the lever of a trapdoor, which then falls and closes the



entrance. A second door at the back is then raised, a bag having been previously stretched over the mouth of the log, and the prisoner rushes into the bag, where he meets his fate. All that is wanted to construct the trap is a hollow log about 5 feet long, having a pipe of 15 inches diameter. A false floor is hinged to the entrance, and a wire catch holds the door lever in position when the door is raised. When the bandicoot runs in to pick up the bait—maize or sweet potatoes—his weight releases the wire catch, the floor falls, and at the same time the door closes on the prisoner. As the trap is left out in all weathers, it should be made of hardwood. The false floor is attached to the wire by a thin piece of string. Mr. Watton says he catches numbers with this trap, of which he has three placed in the most conspicuous parts of the farm.

CURING SKINS.

In reply to inquiries from correspondents, the "Journal of the Jamaica Agricultural Society" publishes the following directions for the curing of skins:—

The following recipe is for curing rabbit and goat skins:—First soak the skins in cold water until soft (if just taken off they wlll not need soaking); then scrape the flesh and grease off. This can be done over a half-round post. Set one end on the ground, and have the other as high as the hips. Place the skin over the post so as to lean against the end of the post, and hold the neck of the skin. In place of a bream knife a long carving knife can be used by winding a cloth on the point, so that both ends can be held to scrape the skin with the middle of the knife. Next make a liquor by dissolving 1 lb. of alum and 1 lb. of salt together in 2 or 3 gallons of water. Set the liquor to cool and put the skins in. Stir them so that the liquor reaches all parts of the skins, and let them remain in the liquor from six to ten days, or longer if in no hurry for the skins. Then dry them in a cool place. Dampen them by hanging up in a cellar overnight, and then stretch them out. This can be done over a spade turned handle down. (Or a stretcher can be made by nailing a piece of 1½-inch plank, 2½ feet long by 8 inches wide, in the centre of a 2-inch plank, 10 inches wide by 3 feet long, in the form of a "T," and sawing a slit in the top of the upright piece, and fitting in a piece of iron or an old hoe blade.) To clean the fur, put 6 or 8 inches of hardwood sawdust (the finer the better) into the bottom of a barrel, and put the skins in, putting more sawdust among and over them; then stand in the barrel and tread them until the fur is clean. The liquor will keep a long time, and as used can be renewed by adding alum and salt. Take of saltpetre, 1 part; salt, 2 parts; alum, 2 parts; pulverise finely and mix thoroughly. From the skins remove all flesh parts; if they have been dried, you must soak them in water to soften them. Then give the skins a thin coating of the mixture, turn the sides in, roll them up, and lay them aside for a few days. The thicker the skins the longer they must lie. A little practice will be the better teacher in this. Now take them and rinse thoroughly; remove all the mixture; wring them out, well rubbing them between the hands, and pulling them in every direction until perfectly dry. By following the above directions you will have skins as soft as velvet. The more you rub and pull them the softer they will be.

The fresh sheepskin should be laid out, skin up, on the floor for a few hours to set, and then be hung up to be painted. The preservative recommended is 1 lb. of common soda, 2½ lb. of arsenic, boiled gently for four hours in 3½ gallons of water, stirred frequently. To treat a skin, use 1 pint of this mixture and add 3 pints of water, which would be enough for 350 skins. This mixture keeps indefinitely in an earthenware or glass jar. A few days after painting, the skins should be examined, and any parts missed should be painted. A skin treated thus would keep for twelve months free of weevils. To dry a skin, hang it from neck to tail, and in baling turn the wool side out, folding in half. In tying bales there should be strips of wood, top and bottom, to prevent the pressure of the wire or rope chafing the skin and reducing the value of the bale.

VALUE OF DEAD LEAVES.

The necessity of preserving dead leaves to form humus should be strongly insisted on. It has been proved by Grandeau and Henry, two of the Nancy professors, that, besides serving as food for earth-worms and other organisms, the activity of which keeps the soil porous, friable, and superficially rich in nutritive mineral matter, dead leaves fix atmospheric nitrogen to the extent of 12 to 20 lb. per acre annually. To deprive an orchard or garden of its dead leaves is like robbing a farm of its dung.

A REMEDY FOR TOOTHACHE.

A London physician, at a meeting of a medical society, stated that extraction of teeth was unnecessary. He was enabled to cure the most desperate case of toothache, he said, unless the case was connected with rheumatism, by the application of the following remedy to the diseased tooth:—Alum, reduced to an impalpable powder, 2 drachms; nitrous spirits of ether, 7 drachms; mix, and apply to tooth.

A CANE-CUTTING MACHINE.

Mr. José M. Callejas, of this city (Havana), has solicited from the Government a patent for a new cane-cutting apparatus of his invention, which, he assures, cuts the cane standing in the fields, strips it of its leaves, and divides it into as many small pieces as may be desired.—"Louisiana Planter."

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Times of Sunrise and Sunset, 1907.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·56	6·45	5·20	6·42	5·40	6·21	5·57	5·47
2	4·57	6·46	5·21	6·42	5·41	6·20	5·58	5·46
3	4·58	6·46	5·22	6·41	5·42	6·19	5·58	5·45
4	4·58	6·46	5·23	6·41	5·42	6·18	5·59	5·44
5	4·59	6·47	5·24	6·40	5·43	6·17	5·59	5·43
6	5·0	6·17	5·24	6·39	5·43	6·16	6·0	5·42
7	5·1	6·47	5·25	6·39	5·44	6·14	6·0	5·40
8	5·1	6·47	5·26	6·38	5·44	6·13	6·1	5·39
9	5·2	6·47	5·26	6·38	5·45	6·12	6·1	5·38
10	5·3	6·47	5·27	6·37	5·46	6·11	6·2	5·37
11	5·3	6·47	5·28	6·36	5·46	6·10	6·2	5·36
12	5·4	6·47	5·29	6·35	5·47	6·9	6·3	5·35
13	5·5	6·47	5·29	6·35	5·47	6·8	6·3	5·34
14	5·6	6·47	5·30	6·34	5·48	6·7	6·4	5·33
15	5·7	6·47	5·31	6·33	5·48	6·6	6·4	5·32
16	5·7	6·47	5·32	6·32	5·49	6·5	6·5	5·31
17	5·8	6·47	5·32	6·31	5·50	6·4	6·5	5·30
18	5·9	6·47	5·33	6·31	5·50	6·3	6·6	5·29
19	5·10	6·47	5·34	6·30	5·51	6·1	6·7	5·28
20	5·11	6·47	5·34	6·29	5·51	6·0	6·7	5·27
21	5·11	6·46	5·35	6·28	5·52	5·59	6·8	5·26
22	5·12	6·46	5·36	6·27	5·52	5·58	6·8	5·25
23	5·13	6·46	5·36	6·26	5·53	5·57	6·9	5·24
24	5·14	6·45	5·37	6·25	5·53	5·56	6·9	5·23
25	5·15	6·45	5·38	6·24	5·54	5·55	6·10	5·22
26	5·15	6·45	5·38	6·23	5·54	5·54	6·10	5·21
27	5·16	6·44	5·39	6·23	5·55	5·53	6·11	5·20
28	5·17	6·44	5·40	6·22	5·55	5·51	6·11	5·19
29	5·18	6·44	...	...	5·56	5·50	6·12	5·19
30	5·19	6·43	...	...	5·56	5·49	6·12	5·18
31	5·20	6·43	...	...	5·57	5·48	...	...

PHASES OF THE MOON.

			H. M.
8 Jan.	☽	Last Quarter	0 47 a.m.
14 ,,	●	New Moon	3 57 p.m.
21 ,,	☾	First Quarter	6 42 ,,
29 ,,	○	Full Moon	11 45 ,,
6 Feb.	☽	Last Quarter	10 52 a.m.
13 ,,	●	New Moon	3 43 ,,
20 ,,	☾	First Quarter	2 35 p.m.
28 ,,	○	Full Moon	4 23 ,,
7 Mar.	☽	Last Quarter	6 42 p.m.
14 ,,	●	New Moon	4 5 ,,
22 ,,	☾	First Quarter	11 10 a.m.
30 ,,	○	Full Moon	5 44 ,,
6 April	☽	Last Quarter	1 20 a.m.
13 ,,	●	New Moon	5 6 ,,
21 ,,	☾	First Quarter	6 38 ,,
28 ,,	○	Full Moon	4 5 p.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1907.	ROCKHAMPTON. Rise.	Set.	TOWNSVILLE. Rise.	Set.	COOKTOWN. Rise.	Set.
January	18 m.	2 m.	42 m.	12 m.	53 m.	9 m.
February	15 m.	5 m.	36 m.	18 m.	44 m.	18 m.
March 1 to 20 ...	11 m.	9 m.	29 m.	25 m.	35 m.	27 m.
,, 21 to 31 ...	9 m.	11 m.	28 m.	26 m.	29 m.	33 m.
April	7 m.	13 m.	20 m.	34 m.	21 m.	41 m.

Answers to Correspondents.

MARE WITH SWELLED UDDER.

C. A. P., Warwick—

The mare foaled three weeks ago, and the udder is very swollen, and appears to be full of water, and as large as that of a full-uddered cow. There is very little pain. Fomenting and syringing have had no effect in reducing the swelling.

Mr. A. H. Cory, M.R.C.V.S.L., veterinary officer of the Department of Agriculture and Stick, recommends:—Give the mare internally 4 drachms of aloes, 1 oz. of acetate of ammonia, in a pint of water. After the first drench has worked, give twice daily 1 drachm potassium iodide and ½-oz. bicarbonate of soda in half a pint of water. Foment the udder twice daily with hot water. Draw off the milk by means of a teat syphon. Rub the udder with camphorated oil after fomenting.

JUJUBE TREE.

F. J. Stevens, Cotton Vale, Mackay.—

The specimen you sent us is from the jujube tree, *Zizyphus jujuba.* This is a small deciduous tree, with short stipular prickles, sometimes wanting; leaves ovate or nearly orbicular, obtuse, 1 to 3 inches long, entire or toothed, covered underneath with a close white or rusty tomentum; flowers small, drupe globular about ¾-inch in diameter. Fruit eatable; the bark may be used in tanning, and the plant forms a strong hedge. Propagated by seeds or cuttings of the roots.

NITRATE OF SODA.

A. Schutze, Yatala.—

Nitrate of soda contains nitrogen equal to about 18½ per cent. of ammonia. Sulphate of ammonia contains about 24½ per cent. of ammonia. To convert nitrogen into its equivalent of ammonia, multiply the nitrogen by 1·2. Thus 10 per cent. nitrogen is equal to 12 per cent. ammonia.

THE SUGAR PRODUCTION OF QUEENSLAND.

W. Weedon, Brisbane.—

Our figures refer only to sugar produced in Queensland, not over the whole of Australia, besides which the only sugar-producing State other than Queensland in the Commonwealth is New South Wales. The figures relating to the Commonwealth and New Zealand requirements have no reference to the countries in which sugars are produced. Briefly, Australia and New Zealand consume 224,187 tons. Queensland produced last year 153,000 tons, consequently 71,187 tons had to be imported. Whence, is immaterial.

GREEN BEETLE.

P. Ehmann, Broadwater.—

The specimen you forward has been submitted to Mr. Tryon, Entomologist, who describes it as follows:—

Family, Scarabæidæ; genus, Diphucephala; species, (?)

These beetles consume the foliage of various plants. A common species partakes of that of the Red Ash, another that of the strawberry plant, &c., &c. The larvæ (grubs) inhabit the soil and consume the roots of plants. One in Victoria and Tasmania gnaws the bark of deciduous fruit trees.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JANUARY. Prices.
Apples, Eating, per packer, Hobart	12s. to 16s.
Apples, Cooking, per packer, Hobart	7s. 6d. to 12s.
Apples, American, per packer	7s. to 12s.
Apples, Local, per packer	2s. 6d. to 6s. 9d.
Apricots, Local, per packer	3s. to 5s. 3d.
Bananas, Local, per bunch	4d. to 1s. 6d.
Bananas, Local, per dozen	2½d. to 3d.
Bananas, Fiji, per bunch	2s. 6d. to 6s.
Bananas, Fiji, per case	11s. 6d. to 12s. 6d.
Cherries, quarter-case	2s. 6d. to 5s. 3d.
Lemons, per case, Local	5s. to 7s.
Lemons, per quarter-case, Imported	from 3s.
Mandarins	3s. 3d. to 5s. 6d.
Mangoes, per case	3s. 6d. to 5s.
Nectarines, per quarter-case	2s. 9d. to 3s. 5d.
Oranges, Local, per packer	5s. 6d. to 6s.
Papaw Apples, per case	5s.
Passion Fruit, per quarter-case	1s. 3d. to 2s.
Peaches, per case	1s. 6d. to 3s. 6d.
Peanuts, per lb.	2½d.
Pears (Cooking), Imported, per quarter-case	9d. to 1s.
Pineapples (rough leaf), per dozen	3d. to 2s.
Pineapples (smooth leaf), per dozen	4s. 6d. to 8s.
Plums, quarter-case	1s. 9d. to 4s. 6d.
Rockmelons, per dozen	6d. to 2s.
Strawberries, per tray	1s. to 2s. 6d.
Tomatoes, quarter-case	9d. to 1s. 3d.
Watermelons, per dozen	3s. 6d. to 8s.
Cape Gooseberries, per quart	3½d. to 5d.
SOUTHERN FRUIT MARKET.	
Apples, per case	5s. to 11s.
,, American, per case	14s.
,, Tasmanian, per case	8s. to 10s.
Apricots, per gin case	5s. to 11s.
Cherries, quarter-case	8s. to 9s.
Gooseberries, quarter-case	3s. to 3s. 6d.
Strawberries, per dozen punnets	4s. to 6s. 6d.
Bananas, Queensland, per case	9s. to 10s.
,, ,, per bunch	2s. to 3s. 6d.
,, Fiji, per case	13s. 6d. to 14s. 6d.
,, ,, per bunch	8s. to 10s.
Chillies, per bushel	6s.
Lemons, per gin case	3s. to 7s. 6d.
,, Medium to good, per gin case	5s. to 7s. 6d.
,, Extra choice ,, ,,	8s. to 9s.
Peaches, per box	4s. to 9s.
Mandarins, Emperor, choice, case	9s. to 10s.
Oranges, medium to extra choice, per case	12s. to 13s.
,, common, per case	8s. to 9s.
Pineapples, per case	3s. to 7s. 6d.
,, choice, per case	10s. to 12s.
,, small ,,	7s.
Rockmelons, per gin case	5s. to 7s.
Watermelons, Queensland, per dozen	8s. to 10s.
,, medium	6s.
,, small, from	3s. 6d.
Tomatoes, Queensland, choice, per quarter case	3s. to 3s. 6d.
,, ,, green ,,	2s. 6s. to 3s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JANUARY.

Article.		JANUARY. Prices.
Bacon (Pineapple)	lb.	8d. to 9½d.
Barley (Malting)	...	...
Bran	ton	£3 15s. to £4.
Butter, Factory	lb.	9½d. to 10½d.
Chaff, Mixed	ton	£3 to £4.
Chaff, Oaten	,,	£3 17s. 6d. to £4 5s.
Chaff, Lucerne	,,	£3 to £3 10s.
Chaff, Wheaten	,,	£2 10s.
Cheese	lb.	5½d. to 6d.
Flour	ton	£7 15s. to £8 10s.
Hay, Oaten	,,	£4 17s. 6d. to £5 2s. 6d.
Hay, Lucerne	,,	£1 15s. to £2 15s.
Honey	lb.	1¼d. to 1½d.
Maize	bush.	2s. 1½d. to 2s. 4d.
Oats	,,	...
Pollard	ton	£4 10s.
Potatoes	,,	£4 12s. 6d. to £6 6s. 3d.
Potatoes (Sweet)	,,	...
Pumpkins	,,	...
Wheat, Milling	bush.	...
Wheat, Chick	,,	2s. 9d. to 3s. 3d.
Onions	ton	£4 15s. to £5 5s.
Hams	lb.	11d. to 1s.
Eggs	doz.	6½d. to 10½d.
Fowls	pair	2s. 6d. to 3s.
Geese	,,	...
Ducks, English	,,	5s. 5d.
Ducks, Muscovy	,,	4s. 3d. to 5s.
Turkeys, Hens	,,	...
Turkeys, Gobblers	,,	...

ENOGGERA SALEYARDS.

Animal.	DECEMBER. Prices.
Bullocks (very Prime and Weighty)	£18.
,, ...	£9 17s. 6d. to £12 5s.
Cows	£9 to £10 5s.
Merino Wethers	19s. 6d.
,, Ewes	18s. 9d.
C.B. Wethers	23s. 6d.
,, Ewes	20s. 3d.
,, ,, (Extra)	35s.
Lambs	16s. 9d. to 18s.
Pigs	Nil.

Orchard Notes for March.

By ALBERT H. BENSON.

By the end of February the marketing of deciduous fruits is practically finished in Queensland, as, with the exception of a few varieties of late apples in the Stanthorpe district, and of persimmons in the various parts of the colony, this season is over.

The finish of the deciduous fruits, however, marks the commencement of the citrus season, and these fruits will be ready for handling in the earlier districts of the State during the month. This being the case, I take this opportunity of calling the attention of all citrus-growers to the following very important considerations:—

FIRST.—*The necessity for preventing this fruit from being destroyed by pests.*

In addition to the various scale insects attacking citrus trees and citrus fruits, the ripening fruit is liable to be destroyed by insects that either suck the fruit, such as the orange-piercing moths described by Mr. Tryon in the April number of this Journal for 1898; or by insects boring into the fruit, such as the yellow pearl moth, sometimes known as the corn moth or borer moth, and the fruit fly. In order to obtain a good crop of marketable citrus fruit, these three pests must be carefully looked after, and every possible means must be taken to keep them in check so as to reduce the damage caused by them as much as possible. The orange-piercing moths can be destroyed in large numbers by the use of poisoned baits consisting of well-ripened Cavendish bananas impregnated with a solution of arsenite of soda, or a soluble arsenical poison, such as the well-known white-ant exterminators. These poisoned baits should be hung up among the orange trees, and they will attract and destroy large numbers of the moths. Ripe Cavendish bananas, unpoisoned, also act as an attraction to the moths, and they may be caught by means of an ordinary butter-fly net when sucking the fruit at night. The yellow peach moth, the second of these pests, is much more difficult to deal with, as it is not easily attracted or captured. It lays an egg on the skin of the fruit, usually where two fruits touch, or else in the folds of the skin, near the stem—in fact, in positions where it is not likely to be rubbed off. The egg hatches out into a minute caterpillar, which eats its way into the fruit, and increases in size till it is fully an inch long. Green fruits attacked by this insect rapidly turn yellow and usually fall off, the loss in some instances being considerable, as the pierced fruit is useless and rots rapidly. There are two remedies—first, the destruction of the young caterpillar as soon as it has hatched from the egg and before it has eaten its way into the fruit, and the second remedy is by the gathering and destruction of all fruits and seeds harbouring either the larvæ or pupæ of the insect. The destruction of the young larvæ or caterpillar is accomplished by spraying the infected trees with Paris green or arsenate of lime, as described in the October number of this Journal for 1900, under the article on citrus culture. The arsenical spray must be put on in the finest possible form so as to completely cover all the fruit on the tree, so that, when the young caterpillar starts to eat the skin of the fruit, it will eat a minute quantity of arsenic and be poisoned. This remedy has proved very effectual in the treatment of the codling moth which attacks pomaceous fruits, and there is no reason why it should not be equally efficacious in the case of this insect as well. One spraying will not be sufficient, as the moths continue to lay their eggs for a considerable time, so

that in districts where this moth is especially destructive to citrus fruits spraying should be repeated at intervals of not less than three weeks.

The last and by far and away the most destructive insect is the fruit fly. It attacks the orange whilst still quite green, and, although the eggs seldom hatch out when laid in the unripe fruit, the injury to the latter caused by the puncture of the ovipositor of the fly tends to a premature ripening of the fruit and to its falling from the tree. Kumquats are especially liable to be attacked by the fly, and often form a very good trap for it, as, if the tree is carefully watched and all infested fruit is gathered and destroyed, a large number of larvæ which would otherwise hatch out and destroy a quantity of fruit would be prevented from so doing. As stated over and over again in these notes and in the articles on fruit culture appearing in this Journal, there is no better remedy for the fruit fly than the destruction of infested fruit, and the removal from the citrus orchard of all worthless and unprofitable fruit trees of all kinds which tend to harbour and breed these insects. Systematic and combined effort on the part of all fruitgrowers to carry out these recommendations will do more to keep this pest in check than anything else, and surely the citrus industry alone is worth taking a little trouble to save, as the quality of the fruit is recognised throughout Australia, and, it is to be hoped, will be shortly recognised in the Home markets as well.

SECOND.—The Peacock or Shoobridge case, which was accepted as the standard case at the Brisbane Fruitgrowers' Conference in 1897, and again at the Melbourne Conference in 1900, for all hard fruits, should be the only case used in which to market the fruit; as it is the only case at present in use in Australia in which it is possible to pack every grade of oranges, so as to have the fruit of an even size throughout, and to have the case properly filled. Fruit, packed in this case, carried well to Vancouver, and no difficulty was experienced in packing the various sized fruits.

Strawberry planting can be continued during the month on same lines as recommended in the notes for February.

Where new orchards are to be planted, it is fully time to see about the preparation of the land, if this has not already been done, as it is advisable to get the land well sweetened before planting. Old worn-out trees, and inferior trees that it is desirable to do away with, can be taken out during the month, the holes from which they have been taken being left exposed to the action of the air, so as to be thoroughly sweetened by the time a fresh tree is planted in the same place. Keep the soil well worked, and where weeds have got the upper hand during the previous month mow them down, and turn them under with the plough, a plough having a short digging mouldboard being the best for this purpose.

Farm and Garden Notes for March.

FARM.—Take every opportunity of turning up the ground in readiness for sowing and planting. The main crop of potatoes should be at once planted. As the growth of weeds will be slackening off, lucerne may be sown on deeply-cultivated soil. The latter should be rich and friable, with a porous subsoil, and should be thoroughly pulverised. Do not waste time and money in trying to grow lucerne on land with a stiff clay subsoil. The land for lucerne should be prepared a couple of months before sowing, care being taken to cross plough and harrow before the weeds have gone to seed. This ensures a clean field. Sow either broadcast or in drills. In the former case, 20 lb. of seed per acre will be required; in the latter, 10 lb. A good stand of lucerne has been obtained

with less quantities. Lucerne seed is worth from 56s. to 65s. per cwt. in the British market. Should weeds make their appearance before the plants have sent down their tap-roots, mow the field. Before they can again make headway enough to do damage, the lucerne will be strong enough to hold its own against them. Harrow and roll the land after mowing. Gather all ripe corn. It is too late to sow maize, even 90-day, with any certainty of harvesting a crop of grain. Rye grass, prairie grass, oats, barley (in some districts, wheat), sorghum, vetches, carrots, mangolds, and swede turnips may be sown. In Northern Queensland, sow tobacco seed, cowpea, Carob beans, sweet potatoes, opium poppy, &c. Sow anatto, jack fruit, and plant kola nut cuttings. Some temperate zone vegetables may be planted, such as egg plants, potatoes, &c. Coffee-planting may be continued. Harvest Kafir corn and paddy.

KITCHEN GARDEN.—During this month a very large variety of vegetable seeds may be sown in readiness for planting out where necessary in the autumn, which begins on the 20th March. All unoccupied land should be roughly dug, and, where required, add well-decomposed manure. Transplant cabbage, cauliflower, celery, &c. Sow French beans, beet, carrot, turnips, radish, cabbage, cauliflower, cress, peas, mustard, &c. Former sowings should be thinned out and kept clear of weeds. Mulch round melon and cucumber beds with a good dressing of long stable manure, as it assists in keeping the fruit clean and free from damp. Cucumbers, melons, French beans, and tomatoes should be looked for every day and gathered, whether required or not, for if left on the vines to perfect their seeds the plants will soon cease to be productive or will form ill-shaped, inferior, unsaleable fruit.

FLOWER GARDEN.—Now is the time to plant out bulbs. A complete garden could be furnished with these charming plants, which are to be had in every colour and variety. Amongst the many are amaryllis, anemone, arum, babiana, crinum, crocus, freesia, ranunculus, jonquils, iris, ixias, gladiolus, narcissus, jacobean lilies, tigridia, tritonia. All bulbs like well-drained, somewhat sandy soil with a plentiful admixture of leafmould. Herbaceous plants and annuals, which it is intended to raise from seed, should be sown this month. Such are—Antirrhinums (snapdragon), asters, cornflowers, dianthus, larkspurs, daisies, cosmia, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas. Cannas now planted will require plenty of food, in the shape of liquid manure. Put in cuttings of carnations. Chrysanthemums require attention in the way of disbudding, staking, watering with liquid manure, &c. Growers for exhibition will thin out to a few buds, and protect the flower from rain and sun. Dahlias should be looking well. To secure fine blooms, disbudding should be done. Now as to climbers which may now be planted. These are—Allamanda Schotii (beautiful yellow); Antigonon leptopus, a charming cerise-coloured climber; Aristolochia elegans, handsome as an orchid and easily grown; Aristolochia ornithocephala (Dutchman's pipe), very curious, large, always attracts attention; Asparagus plumosa grows in any shady place; Beaumontia grandiflora, splendid white flower, grand for a fence, will grow 50 feet high; Bignonias of several kinds; Bougainvilleas, with their splendid leafy pink and purple flowers, rapidly clothe a fence or unsightly shed with a blaze of blossom; Quisqualis indica, a fine creeper, flowers pink, changing to white; Wistaria, purple and white. Most beautiful is the Bauhinia scandens, rarely seen about Brisbane, not even in the Botanical Gardens. We grew a plant of this climber at Eton School, Nundah, and it soon closed in the front of the veranda for a distance of over 80 feet. The leaves are very small, and in the flowering season it presents almost a solid mass of beautiful round bunches of blossom, something like the hawthorn bloom—pink and white. It seeds freely, but the seeds are difficult to germinate, and when they have produced a plant it is still more difficult to rear it. A rooted sucker from the main stem will in all probability grow.

The A.N.A. Exhibition in Melbourne.

The accompanying illustrations will give the reader a very accurate idea of the extensive and artistic erection devoted to the exhibits of fruits, fibres, plants, and of the various products exhibited. The total space covered by the Queensland Courts embraces an area of 7,000 square feet, and the whole of this space has been utilised to the utmost. The court is situated in a favourable position in the centre of the great Exhibition Building, under the dome; and its main distinctive feature is a series of graceful pillars and arches, rising to a height of over 30 feet. These are ingeniously overlaid with ginned cotton and wool, which give them a brilliantly striking appearance. The whole is surmounted by a light dome-shaped roof, on the top of which is a sheaf of wheat surrounded by the British and Australian flags. Beneath the roof and within the pillars is a platform, 55 feet long and 20 feet wide, on which a great variety of fruits peculiar to the tropical and temperate portions of Queensland are exhibited—some on a graceful pyramidical trophy, and others on the platform.

THE FRUIT SECTION.

It is not necessary to give a list of all the fruits shown, but it may be mentioned that custard apples, breadfruit, jackfruit, dates, and mangoes, with oranges and shaddocks, were about the only fruits which were not to be seen in this unique collection. Mangoes are prohibited from being landed in Victoria. Still, two fruits were obtained from a good-natured captain of a steamer from Queensland, and these excited almost more attention than the papaws, granadillas, chokos, vanilla, rubber, &c. The other fruits mentioned, not being in season, could, of course, not be shown. However, such a variety of fruits as was here shown, all being *bonâ fide* Queensland-grown, could not be shown by, not only any other Australian State, but by any other country in the world.

The want of knowledge of some of our commonest fruits on the part of the Victorians who visited the court was most marked, and this want of information was not confined merely to the fruit, but to the State of Queensland itself, many being utterly ignorant of its whereabouts, and the general opinion being that it was a State intensely hot, quite unfitted for white people to live in, usually in a state of drought, and generally in a state of primitive barbarism, the principal portion of the inhabitants being aboriginals, and the live stock snakes, alligators, and mosquitoes. Of course, these remarks do not apply in the case of educated and travelled Victorians. As regards the fruits, many believed that pineapples grew on tall pine-trees, and that when the pineapples were gathered the tree was cut down and sawn into boards for butter-boxes. Others firmly believed that pines grew underground, like carrots; that cocoanuts were borne on a tree in the same state as they are seen in shops—*i.e.*, minus the husk; and that sugar grew on bushes, and so on. How quickly all these false impressions have been dissipated is proven by the number of farmers who, with their families, have left Victoria to settle in Queensland. Over a hundred and fifty able-bodied farmers, with stalwart sons and considerable capital, have either gone already or are selling

out their Victorian farms to make their home in what is now recognised throughout Victoria as the grandest State and the richest in all natural resources of all the States of the Commonwealth.

How has this revulsion of feeling been brought about, and how has the darkness of ignorance concerning the northern State been turned into the light of knowledge bestowed by this Exhibition and by its prodecessor! In the first place, there are the palpable evidences of the abundant fertility of the soil, its cheapness, and its proximity to railways, and of the marvellous climatic conditions of the State. To aid in the work of impressing this object lesson on the Victorian public, an Intelligence Bureau and a Tourists' Bureau were established in the Queensland Court, which proclaimed not only its advantages, but also distributed thousands of pamphlets, illustrated books, picture post cards, and leaflets explaining the land laws of Queensland, the position of the best lands with respect to railways, tramways, and other means of transport. The Bureau was supplemented by the exhibition of hundreds of lantern slides, accompanied by lecturettes, showing every conceivable feature of rural life and products of the State. Lectures were also given in a large hall set apart for the purpose on the products of the State, such as sugar, cotton, coffee, fruits, &c., and the condition and profits of these industries. All these lectures were profusely illustrated by electric lantern slides. Again, there were lectures on the forests and the various classes of timbers indigenous to the State, also accompanied by excellent lantern views. The crowds who attended these lectures continued unabated to the last, and it may truly be said that, if ever Queensland was thoroughly advertised, it has been advertised on this occasion throughout the length and breadth of Victoria, not only by the comprehensive exhibit of products, but by the information readily obtainable concerning them.

THE MINERAL SECTION.

There are many countries of the world which are rich in minerals of many kinds, but we do not think that any of those countries could make such a magnificent display of minerals as has been shown at this exhibition. Nearly all of them are, as we know, being exploited commercially, and the specimens are, therefore, not only interesting as such, but as indicating the actual wealth of the country. Of bulky exhibits, copper and tin are prominent, and both are shown in all stages, from the ore to the ingot, ready for export. These exhibits alone are valued at about £2,000. Amongst other minerals which are exported from the State in quantity are wolfram, molybdenite, scheelite, monazite, bismuth, together with gold, silver-lead, antimony, manganese, coal, and graphite, and many others. The only graphite mine which is being worked to a profit in Australia is one at Mount Bauple, on the North Coast line, and the specimens shown attracted considerable attention. As far as coal is concerned, the exhibition served to open the eyes of the Victorians interested in the mining industry to the actual and potential value of the enormous deposits of various kinds of coal, suitable both for the manufacturer, the railways, and the Imperial and mercantile navy. There were very fine specimen blocks of the anthracite smokeless coal from the Dawson-Mackenzie and other mines, and others from the southern coal-mining districts in West Moreton.

In conjunction with our vast deposits of hæmatite and other iron stones, limestone and marble, the coal industry cannot fail to form the basis of a

Plate IX.

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1. The Mineral Court.
2. Forestry Avenue and Central Trophy.
3. Bird's-eye View of Queensland Court.

Plate X.

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4. INTELLIGENCE AND TOURISTS' BUREAU.
5. FRUIT TROPHY.
6. SISAL FIBRE TROPHY.

very large iron-founding industry, and the time is not far distant when Queensland will manufacture her own steel rails, ship's plates, parts of engines, &c., instead of importing them as at present.

Besides the metals and minerals, the eye is attracted by a variety of gems, such as sapphires, turquoises, zircons, rubies, corundum, &c., from Anakie, in the Central district. Opals from the far south-west, beyond Cunnamulla and Thargomindah, and even diamonds from the Central gem fields. Taken as a whole, the mineral section of the Queensland Court is what may be called "an eye-opener."

THE FORESTRY SECTION.

Here, again, Queensland comes brilliantly to the front as compared with the small display of Victorian timbers, from the Otway Forest. To the great bulk of the visitors to this section, the existence of such a number of varieties of splendid woods, all of great commercial value, was simply unknown and surprising. All the commercially valuable timbers of the State are here artistically displayed in all their stages, from log and stump to planks, rough, dressed, and polished. Railway sleepers, rough hewn, as they are exported by Queensland to other countries in thousands, are to be seen side by side with beautifully finished articles, such as railway carriage doors, picture frames, inlaid tables, walking sticks, fishing rods, articles of furniture, made of silky oak, cedar, bean-tree, silkwood, bunya pine, kauri, &c. The strength of the crow's foot elm axe handles was demonstrated by one of these being supported at both ends while it sustained the weight of over 16 stone in the person of Sir George Le Hunte, Governor of South Australia, standing on its centre. A further proof of the enormous tenacity of this grand timber was given by an experiment made at the University. A piece of elm, 5 feet long by 2·95 inches by 2·92 inches, sustained without breaking a weight of 2,350 lb., or more than a ton, the deflection amounting to only 1¼ inches. These and other timbers attracted considerable attention, and very large orders could be obtained for them if it were possible to fulfil them. But we are informed that our local sawmillers even cannot obtain supplies of timber sufficient to keep their mills running at full capacity, owing to the scarcity of teamsters, who are giving up timber-hauling and taking to the more profitable dairying industry. The only remedy for this state of affairs would appear to be the construction of light railways or tramways into the heart of the forests and scrubs, as was so successfully done at Noosa by Messrs. McGhie, Luya, and Co., to reach the kauri pine on their selection, and by the Messrs. Munro, at Toowoomba.

GENERAL PRODUCE.

Under this head may be classed all Queensland's exhibits of farm produce, such as sugar, cotton, coffee, wheat, hay, potatoes, cereals of various kinds, roots, &c., all of which attracted crowds of interested inquirers, especially those numerous visitors who have made up their minds to sell out of their Victorian properties and settle on the cheap and fertile lands of Queensland. Of these there is a very large number, and it is very gratifying to know that our State is being peopled by well-to-do, energetic young farmers, experienced in the methods of farming adopted in new countries. We gladly welcome them, at the same time that we trust that some scheme will be speedily adopted to furnish them by immigration with a full supply of suitable labour, which is now so urgently needed in this Northern Paradise.

Agriculture.

SHEEP ON THE FARM.

There can be no question that the Australian farmer is realising more and more the value of sheep as an adjunct to general farming. The seasons have been, and are, in all probability, likely to remain propitious for a long time to come. The price of wool keeps up, and there is little likelihood of a decline, besides which sheep and lambs are very high priced. We print below an article bearing on this subject from the "Live Stock Journal," which is most interesting, and will doubtless be thought so by all readers of the Journal who have gone in for sheep-raising on their farms:—

The sheep and wool trade in every country has come to the front during the last two years in a most vigorous style, and, talk to whom we will, we get the impression that things have taken on a new lease of life. This is largely due to the fact of wool having sensibly increased in value, until at last the depressed sheep farmer has plucked up courage and begun business in an altogether different frame of mind. Those who have tarried by the sheep when prices were low have just cause for thankfulness, and neither Australian, South African, nor even English sheep men can find fault at the returns they have received during the past two years. Neither does the immediate outlook indicate much to discourage the average sheep farmer, for wool values are still high, and likely to remain so. The price of sheep stock is good and profitable, consequently there are those factors present which inspire and encourage. Taking stock for stock, and the amount of money invested in sheep compared with other classes of farm animals, sheep without doubt give equally as good a return, while many are of opinion that the percentage of profit is higher than for cattle. No man is in business for pleasure or even sentiment, and it seems to many that the sheep industry is to-day yielding fairly adequate returns for the money invested. So long as wool continues to go at a fair price, so long will the sheep industry continue to give good returns, and, as the number of sheep throughout the world is declining, excepting in Australia, prospects point to a continuance of all about to-day's rates.

Sheep on the land are golden-hoofed. Where they tread they, as a rule, improve the soil, although to some extent the remark is a metaphor. On the lighter soils, chalks, gravels, and sands, treading is literally an improvement, for it assists in the consolidation of the soil, while at the same time the animals are dropping liquid or solid manure, not one particle of which is or should be practically lost. On the heavier soils the treading of sheep may at some time damage the condition of the soil, speaking mechanically, but that is inevitable; no man, however, would fold his sheep on heavy clay to cause it to poach. Sheep, then, have two values—first, that of improving the soil, either by manuring it or by treading and manuring combined, and next by providing mutton and wool. How, then, can we increase the profits which they return?

Every agriculturist is aware of the fact that the better the quality of the parent stock, whether it be animal or seed, the better the result in the produce. A great majority of English farmers own flocks which consist of animals which are practically mongrel in blood. They may be of the type of the pure breed of the district, or they may not be; they are annually mated with rams which many select at liberal prices from good flocks of purebred stocks, and in this way the character of the flock is to some extent maintained, especially where the ewes are selected for breeding and the inferior rejected.

It happens, however, that every healthy ewe is mostly retained, however imperfect she may be in form, breeding capacity, and mutton-making character. The only way to level up to a high standard is to reject every animal from the breeding stock which fails to pass a standard of excellence, and that standard should be rigidly adhered to. The first thing, then, to note is the prime importance of blood, which imparts character, size, quality, prolificacy, rapid fattening, and the power to produce the best meat in larger quantity on the best parts.

But there is something else which must not be forgotten. Sheep must be fed, and the provision must be made to feed them as economically as possible. The larger the quantity and the better the quality, and the greater the suitability of the food grown on the farm, the less need is there to purchase cake and corn. Sheep need a large quantity of nitrogenous food, partly for which reason cake, peas, and beans are supplied; but, where possible, they should be provided with vetches, or tares, sainfoin, clover, and crops of the same family, in addition to the root croops on which they are fed during the winter. The feeding of the lambs should be not only sound, but rapid, and where ewes are kept for breeding those selected for stock should be liberally fed with cake or corn when put to the ram. Many flock-masters have noted the immense importance of good feeding at this period, and have shown the influence which is exerted in the production of twins. Moreover, the breeding ewe, having to provide for her offspring as well as for herself, requires liberal feeding throughout. Without it she loses condition, produces weakly lambs, and possesses little, if any, milk. Here, then, is one example indicating how the flock may be increased in value and return larger profits, although we do not forget for one moment that the best flock-masters, to a man, practise the very precepts which we have endeavoured to lay down.

The quality of the wool produced by sheep is very materially affected by the feeding which the animals receive when the wool is being grown. Whenever sheep are allowed to run down in condition, a distinct weakness of the fibre of the wool will at once manifest itself in that portion which is at that particular time in course of active formation. When wool goes on the looms, its inferiority at once becomes evident by the fibre breaking up and damaging the quality of the fabric into which it is being manufactured. In the production of wool it has been found that foods rich in albuminoids are the best. In an experiment conducted some time ago in Hohenstein, two lots of sheep, fed on hay and bean meal, maintained their live weight, and produced 10 lb. of wool; two lots, fed on straw and mangels, lost 21 lb per head in weight, and produced only 7½ lb. of wool; while another lot, fed on hay and straw, lost 12 lb. per head in weight, and produced 8 lb. of wool.

"Growing wool is one thing, shearing is another thing; pulling wool is likewise another; so also in judging, buying, or selling wool," observed a wool expert on Bradford 'Change the other day. Each of the above divisions has its expert, who is trying to get the best of the situation. Judging wool is a fine perception. The wool character rests upon softness, soundness, fulness, and freeness. The fleece must have a soft, resilient fibre, produced by the transparent oil, which attracts the dirt and gives the wool on the sheep a darkish, dirty appearance. It is best noted in the wool on the neck. Wool must have strength. The wool along the ridge of the back is the best to test the whole fleece for strength. Pull out a lock there, gradually strain the fibre by pulling the ends with both hands. If it parts, the whole fleece is weak and unsound. Poor food causes weakness in wools. Fulness is a misnomer, in a sense. If large spaces of skin line between the locks, the fleece is not full. On examining the wool of a perfect fleece, the staples or locks should freely fall apart. The matting will first show along the ridges at the back. Thus the wool buyer seeks the neck locks and those along the back for judging the fleece.

SHEEP ON THE SMALL FARM.

About four years ago we came across the following sensible article on sheep on the farm by a correspondent of the "S. A. Journal of Agriculture," who wrote under the pseudonym of "Dugout":—

Most farmers now recognise that sheep on the farm are necessary to good husbandry; nevertheless, there still exist in our midst a good many small farmers who think they can do without sheep, and it is at these men that I am pointing the finger.

Sheep on the farm are as necessary as are children. The children do the odd jobs: run up the cows and horses, fetch the mail, and a host of other things that would not be done at all, or would not pay to do, if they had to be done by adults; so, in a different way, sheep supply the oddments on the farm; they provide the home with mutton when it is required. The average farmer who has not sheep may be seen wasting three or four hours a week driving away to some neighbours for a sheep, and generally winds up by falling out with a very decent neighbour because he has taken back a skin worth about 1s. 6d. instead of one worth 5s. or 6s., because he has dried it on a post and made it like a belltopper, instead of drying it on a rail and in the shade. Then there is the bit of wool, which will probably pay for the keep of the sheep, besides perhaps a little from the sale of what are not required after shearing, &c.

The breed of sheep must be fixed according to the part of the country you are in, but, generally speaking, the merino should be the foundation stock, if not wholly merino. Cleaning land and rearing fat lambs hardly go together; they may in good seasons, but if in average seasons you clean the land you don't fatten the lambs; or, on the other hand, if you fatten the lambs, you don't clean the land. For when you want to ripen up the lambs they should be hunting for green straws on the fallow, and wandering over fallow is not conducive to fat.

Generally speaking, the man that has not had some knowledge of sheep has a very exalted idea of how may sheep he can keep; he seems to think they should be studded about the field like a good crop of melons on a pumpkin patch. The man who thinks he knows is worse than the one who knows he doesn't know. So if you have not had sheep before, and you imagine that you can keep 300, get 150, and you will be on the safe side. In a general way, it is not good business to buy old sheep; three young sheep can be kept where you could only keep two old ones. Old sheep often need nursing; young ones you can be offhand with; the latter will make a living almost anywhere and do the cleaning for you; the old ones can't do it properly. To the man who is new at the game, buying sheep is the worst and most difficult part of the whole business. Any mug can sell sheep; if they are of decent quality, they will sell themselves. Buying is a different matter. If you don't know much about sheep, ask someone else to act for you. Not the common gasbag that reckons he knows everything, but one of the sort that are rather diffident about giving an opinion. Some of these you will probably know. Tell one of them what you want, and let him buy for you.

Shear your sheep just before the grass seed begins to shoot out of its stalk. It is better to shear a little early rather than be late with it. Fit shearing in between your fallowing and your hay-making. Don't be gulled by woolbrokers into making four classes out of six bales of wool; just take off the dirty edges—those small pieces that are about the armpits and the crutch; burrs don't count for much with buyers nowadays.

A last word of caution. I have some knowledge of what I am writing about, picked up principally from what I have seen others do. I have seen a good many brought nearly to ruin by buying too many sheep for the feed they had; so don't get more mouths than you can fill properly.

[We can commend to our readers our correspondent's rough-spoken wisdom. It appears to us, however, that his attitude, whilst certainly commendable

to-day, may be in need of revision to-morrow, when sheep and live stock generally will no longer be looked upon as more or less necessary evils, fed on the natural herbage left along the fences and roadways, but will form the principal business of the farm, towards the wellbeing of which every farm operation will be directed. In such times it is not unlikely that sheep will be found "studded about the field like melons on a pumpkin patch."—ED.]

THE COW-PEA.

A correspondent who has no back numbers of the Journal will find replies to all his questions in the following article written for the Journal in 1897, by Mr. H. A. Tardent, then manager of Westbrook State Farm:—

One of the phenomena which most strikes the careful observes of the agricultural and economical conditions of Australia is the rapid deterioration and impoverishment of our agricultural lands. From east to west, from south to north, the signs of it are everywhere evident. In certain countries, renowned for their agriculture, judicious manuring and an intelligent rotation of crops enable the agriculturist to grow, every season, large and remunerative crops on soils which have been for hundreds, nay thousands, of years under cultivation. In other less advanced countries a periodical fallowing of the land provides the rest required by Nature. But here—as a rule—nothing of the kind is practised. As soon as the land is broken up, the settler grows on it the same crop year after year—in some places two or three times a year without manuring, without rotation of crops, without any fallowing.

As Nature never permits her wise laws to be sinned against with impunity, the results of that "Raüb-cultur," or "robbing cultivation," as the Germans call it with a proper and expressive word, are not slow to be felt.

The fertile plains of the south, where the pioneers of the early days used to grow from 25 to 35 bushels of wheat to the acre, are now reduced to an average of 10 and in some places even to 5 bushels to the acre. In the north of the continent, the sugar-growers begin to remark similar decreases in the returns of sugar-cane on soils which, in their virgin state, were considered to be amongst the most fertile in the world. The same may be said of the maize, banana, and pineapple lands, on which, not only the crops are on the decline, but where they are also, every year, more and more subjected to various insect and fungoid diseases.

Such a neglect of the elementary principles of sound agriculture is the real cause of the many abandoned farms to be seen here and there in the very best agricultural districts of the continent. Nature rebels against the man who has become her tyrant and exploiter, instead of being simply her master and benefactor. The farm shakes off as a noxious parasite the man who has been living on its vitals, instead of contenting himself with the legitimate yearly income of a well-cultivated land.

Where is, then, the remedy for such a regretable state of affairs?

The question is a vast and complicated one, and requires careful study. It embraces the whole subject of manure and rotation of crops, which it is not intended to treat in this short article, the writer wishing only to attract attention to the most menaced point and the one easiest to be remedied.

As is well known, of all the elements necessary to plant life, nitrogen is perhaps the most important. In any case it is the costliest and the most difficult to keep in the soil. This seems rather strange, when we remember that four-fifths of our atmosphere is composed of nitrogen, so that the plants are, so to say, constantly bathed in it. Unfortunately, plants do not absorb and fix nitrogen through their leaves as they do carbon. They eat it in the soil by the extremities of their rootlets when it has become what chemists call nitrates—that is, when it has combined with some other elements forming the humus or decayed vegetable matter of the soil.

But how does nitrogen get fixed into the soil, or, in other words, what produces that nitrification of the soil? The question has for thousands of years been a puzzle to the cleverest and shrewdest scientists of the whole world. True, according to Theophrastus, Pliny, and Columbella, the ancients had empirically found out that they could enrich their soils by ploughing in green crops, and such a practice was extensively followed in ancient Greece and in many parts of the Roman Empire. At the beginning of this (nineteenth) century, chemical science had made sufficient progress to enable de Saussure, Boussingault, and others to explain that the beneficent effect of such ploughed-in crops was due to the singular property possessed by a numerous family of plants (the Leguminosæ) to provide not only enough nitrogen for their own requirements, but also to leave a good supply of it in the soil in which they were grown. But how that was being done remained still a mystery.

In recent years, however, the discoveries of Pasteur and Koch have completely transformed many of the natural sciences, by establishing beyond doubt that most of the changes which take place in Nature are the work of tiny organisms generally known under the names of microbes and bacteria. Being now put on the right track, two most conscientious and sagacious scientists (Willfarth and Hellriegel) directed their investigations on the various members of those nitrogen-producing leguminous plants. On most of their roots they found nodosities—or knots—and in those very nodosities, the tiny bacteria which first absorb the nitrogen and then fix it in the roots and soil.

Modern scientists take good care to leave us no room for doubting their assertions. For instance, if the bacteria of a leguminous plant are killed—or sterilised, as the operation is called—that plant will grow like any other ordinary plant, without producing any nitrogen whatever, and taking from the soil that which it is in want of to form its tissues (protoplasm) and cells. Still more wonderful: Those tiny nitrogen-producing organisms are being isolated and cultivated—that is, multiplied like farm animals. They are then put in hermetically sealed bottles and sold—under the name of "nitragin"—to farmers, who sow them on their land. And at once those bacteria start their wonderful work of absorbing nitrogen and transmitting it to the soil.

But those ultra-scientific means of enriching our lands with nitrogen are not yet within our reach.

Fallowing, during which it is probable that as yet unknown bacteria enrich the soil with nitrogen, is not to be recommended in this country, especially in summer. It is not improbable that the great heat kills those useful beings or paralyses their action. In any case it is in some way injurious to them. If any nitrogen is being formed during fallowing, it is often washed by heavy rains out of the reach of plant roots. And, finally, fallowing gives full play to noxious weeds which take hold of the field to the great detriment of the following crops.

Commercial nitrogenous manures are not seldom either too expensive or require too great an expenditure of labour to be profitable. So that the simplest and cheapest way to give our fields the nitrogen they absolutely require, especially for cereals and other exhausting crops, is to grow on the fields leguminous plants, and plough them under whilst they are still in a green state. During his long residence in Western Queensland, the writer has been experimenting for years with plants of that family, with a view to finding one answering all the requirements of a fertilising crop. None gave him entire satisfaction. Some, as lucerne, for instance, occupy the land far too long to form part of a regular rotation; others are of slow growth, or cannot stand the drought or a wet season. He was beginning to doubt of ever succeeding, when a few years ago the solution came to him from quite an unexpected quarter, when he received from the Department of Agriculture a few seeds of the so-called "cow-pea," which Professor Shelton had recently introduced from America into Queensland. If the cow-pea is given in our national economy the place it deserves, it is bound to entirely revolutionise our agriculture. The

time will come when it will be recognised as the most important economic plant ever introduced into Queensland, not excepting wheat and sugar-cane. The only faults to be found with it are its botanical and vernacular names, both of which are at the same time misleading and nonsensical. It is not a *vigna;* it is still less a *pea.* It is more like a French bean than anything else in the vegetable kingdom, except that it is more vigorous, hardier, and more prolific.

There are many varieties of it, such as the Black, the Large White, the Small White with a small eye, and the Clay-coloured, &c., each of which has its advantages. The writer has, so far, grown only the two last-named, and found that the Small White is superior as a green vegetable (cut up like French beans or boiled as peas), whilst the Clay-coloured seems preferable for green manuring and as a fodder plant.

Mr. Valder, whose opinions on all agricultural matters deserve always the greatest consideration, has grown successfully the four abovenamed varieties at the Wagga Wagga Experiment Farm, New South Wales. He recommends the Black and Clay-coloured for manuring, the Small and the Large White for culinary purposes.

Here, in Queensland, the cow-pea is likely to do well in every part of the colony. It might happen though, in the course of time, that in the hot moist North it will be attacked by the Common Bean Rust (*Uromyces phaseoli*). But, so far, no complaints of any kind have been heard, although I understand the cow-pea is already extensively grown there by the Colonial Sugar Refining Company and other planters who carry on agriculture on scientific lines and as a paying concern.

In the West it does admirably. It likes a shower at planting and just before flowering time. But, taken all round, it stands—with proper cultivation —the longest of droughts remarkably well. During the last trying season, after four months of uninterrupted drought, the cow-pea plot was standing vigorous and healthy, with its dark-green foliage as fresh as in a hothouse.

The cow-pea thrives in almost any soil, although it does best, of course, on a friable, sandy loam. The land must be ploughed deep, and be well pulverised. A dressing of wood ashes is the manure most likely to be beneficial. It can be planted—for main crop—as soon as the frosts are over. It is very sensitive to cold, the slightest frost killing it. The rows should be 3 feet apart, and the plants 1 foot apart in the rows. When planted in rows, one bean is enough for a plant, in which case about 8 lb. will sow 1 acre. With favourable weather, the plants appear over ground in from three to five days. Keep the weeds down and the land in good tilth with the Planet Junior, at first deep set and then gradually shallower (the last point is very important). In a couple of months, the plant will take care of itself, the whole field appearing as an uninterrupted mass of foliage. If grown for green manuring, now is the time —that is, when the flowers begin to appear—to roll it down and plough it under; the plough being provided with a Yankee mouldboard, a sharp, revolving coulter, and a heavy chain dragging in front of the mouldboard. If time permits, it is not a bad plan to let it rot on the soil. It can also be mown down and made into excellent ensilage, especially if mixed with corn or sorghum; or it can be turned into hay. This latter is a little difficult to gather at the proper stage of desiccation. If too dry, the leaves crumble into dust; if too green, the thick, juicy stems may turn mouldy in the stack. With care and attention, both drawbacks can be avoided. In that case, the whole stack will undergo a gentle fermentation, and the hay will appear of a slightly brownish colour and emit a sweet honey-like fragrance.

The cow-pea can also be eaten down in the field by sheep, cattle, and horses, which are all very fond of it.

And last, but not least, it can be grown for its beans as a money crop, and by no means a bad one either.

The pods have to be gathered by hand as they ripen. Children are especially skilful at that work, provided they are shown that they must not

pull on the plant, but gently break off the pods with their thumb-nail. There are, as a rule, from 20 to 40 pods per plant, each containing from 10 to 15 beans, which means a return of from 25 to 35 bushels to the acre. As soon as gathered they should not be heaped, but stored carefully in an airy place to dry. In the bush, a good plan is to put them in thinly-woven bags, and hang them under the veranda roof. They can then be thrashed with a flail. Be careful, though, not to hit too hard or to thrash when the beans are too dry, otherwise many beans will be crushed. Then pass through the winnower. Should none be available, select a windy day; pour the beans from a dish held level with the shoulder into a tub lying on the ground—twice or even three times in succession—by which means the wind will blow away all the particles of parchment-like pods, leaving the beans perfectly clean. Then bag and keep in a dry place.

Have them for sale, as they are now in great demand at 3d per lb., which means a return of from £15 to £25 per acre. Have them in store the whole year round for your own and your family's use. They form at all seasons a most acceptable food, being the most concentrated and most nutritious of all vegetables. If still a few are left, boil them and feed them to pigs, which will turn them into an excellent bacon.

If we sum up, we now find that the crop of cow-pea has provided you at your choice:—

1. With green pasture for farm animals.
2. With ensilage.
3. With hay.
4. With a good supply of beans, which means a handsome cheque per acre, and a good saving on the butcher's, baker's, and grocer's bills.
5. It has kept your land perfectly free from weeds.
6. It has enriched it with an abundant supply of the precious nitrogen; so abundant, in fact, that the visitors to the farm, seeing the extraordinary difference in favour of the plants—wheat and maize—grown on the cow-pea plots, would ask whether there had not been a sheepyard there before.
7. It has not appreciably impoverished the soil of its mineral matter, as the cow-pea has powerful roots—sometimes 1 inch in diameter, which sink deep and wide in search of food, loosening the soil in every direction and bringing its mineral constituents within the reach of the roots of the following crops.
8. It leaves the land in a perfectly pulverised state.
9. It does not occupy the land long. When sown in the spring, the crop is gathered in December and January, and can be followed by corn, sorghum, millets, pumpkins, potatoes, &c. If sown in November, immediately after harvest, it has yet time to mature before the next sowing season comes in.

CONCLUSION.

Mr. Brünnich, the Government Agricultural Chemist, who has had considerable experience with the cow-pea, estimates its manurial value at £5 per acre. That means that every year in three months' time, and for 2s. worth of seed, the Queensland farmer can increase by £5 per acre the value of his cultivated land. Let everyone now pause and reckon by how much he can make himself richer, according to his acreage.

For the 300,000 acres we have now under plough in the colony, the above figures represent £1,500,000 taken annually directly from the inexhaustible reservoir of the atmosphere and transmitted to the soil by the medium of the cow-pea, and those marvellous helpers conquered and, so to say, domesticated by science for the use of the intelligent and progressive farmer!

ONIONS AND ONION-GROWING.

By THE EDITOR.

As the time approaches for preparing for an onion crop, it will not be out of place to give directions for sowing the seed and for the after cultivation of this most valuable vegetable. There is no reason why onions should be imported in such quantities as we see daily arriving by steamer from the southern colonies. The climate here is perfectly adapted to them, and, if only planted on suitable soil and given the necessary attention, heavy crops are an almost certain result. At one time it used to be said that onions could not be profitably grown as a field crop in the Blenheim district, near Laidley. To disprove this, the writer determined to experiment on the sandy loam of the scrub land on Sandy Creek. The seed was sown in April; the variety, Brown Spanish. The land to which they were to be transplanted was well worked and then rolled to make a hard compact bed. Transplanting was carried on throughout July, and the season having proved favourable the result was a heavy crop of magnificent bulbs, which gave a splendid return for the labour expended. Now, if such a result can be obtained by one farmer, it follows that others can do the same. As there are thousands of acres of similar land under cultivation both there and in many other portions of the State, it only requires determination on the part of the farmers to enable them to successfully displace the importations from the south.

On looking over an old diary of farm operations, it appears that the writer's crops averaged 6 tons per acre, and was sold at £25 per ton. Are there many crops which will give a like return? The present price of onions in the market is £4 10s. per ton. Now, suppose a crop to yield 8 tons per acre (and we know that double that return has been made), the cash return for a medium crop will amount to £36. Certainly there is a considerable amount of labour involved in planting out an acre or two of onions, but that labour is amply compensated for by the net returns.

A consideration of the following notes, based on practical experience, may, therefore, be of some service. Let us first consider

THE SOIL.

The most suitable soil for onions is a rich sandy loam, such as that of the Blenheim scrubs—free, friable, and easy to work, a soil that will not cake, and not lying so low as to retain the superabundant moisture after heavy rains. In such a case the land should be well drained. An eastern or south-eastern aspect has been proved to be better than if the land sloped to the west, as the onion does not require intense heat to bring it to perfection.

Before sowing the seed, it is important that the seed beds should be clear of weeds and of their fallen seeds. By sowing in April or May, there is not much to fear from weeds; still it is advisable that the land, both of the seed beds and of the area proposed to be planted out, should be turned up and exposed to the weather for some time previous to sowing. As soon as the weeds appear, give the land a good scuffling, and if this be done two or three times between February and April there will be no trouble afterwards. If the soil be not virgin scrub, or if it has borne crops for many years in succession without manuring, it should be thoroughly well manured with stable dung, ashes, bonedust, &c., as the onion demands plenty and the best of nourishment. New scrub land is rich enough in natural fertilisers not to require any addition of manure.

PREPARING THE SOIL.

In planting out onions a very serious mistake is often made, and that is, the soil is carefully worked, reduced to a fine tilth, and the plants are set out in a soil which is loosened to a depth of perhaps 8 inches. From land prepared in this manner, no good results need be expected. The onion requires a firm

bed; otherwise the plant, instead of making a large well-shaped bulb, will run to neck, and have more the appearance of a leek than of an onion. Therefore, the land before being planted must be well solidified by rolling.

The Seed Bed.

Onions may be sown broadcast, or they may be drilled in, or they may be sown in a seed bed and afterwards planted out in the same manner as cabbages. The best way is to drill them in. In this case, about 2 lb. of seed per acre will be required. The seeds must be dropped at a distance of about 2 inches apart in the drill, and the drills should be from 12 inches to 15 inches distant from each other. The plants will afterwards require thinning out with the hoe. When sown in a seed bed, planting out must be resorted to—a tedious process, but one that pays well for doing well.

On rich soil the plants may be 6 inches apart. The drills should be slightly raised, and the roots of the plant firmly embedded in it—allow the bulb to, as it were, squat on not under the surface. As the plant grows, the soil must be kept perfectly clear of weeds, and, where the working of the ground has thrown the soil against the bulbs, it must be drawn down, so that only the root is in the ground. Where this has not been attended to, the remedy for the resulting want of bulb formation is to wring the necks of the plants, or, at least, to bend them down with a twist. This will have the effect of inducing the formation of bulbs.

When sowing the seed, care should be taken that they are not covered to more than their own depth. If sown deep, many seeds fail to germinate, and most of those that do appear will make an abnormal growth of neck, causing much labour in drawing away the soil from the incipient bulbs. The writer has never sown onions broadcast, and therefore offers no opinion on the value of the method. Of course more seed would be required per acre, and, if weeds are troublesome, a good deal of hand work would be necessary.

Now about the seed. There are few seeds so annoyingly deceptive as onion seed. So difficult was it to get good seed in the State even at 10s. per lb. in the good old days, that growers imported it from Spain. The largest growers at Oxley, Messrs. Martindale and Nosworthy, were most successful with imported seed, but the writer had a very bad experience in this business. Twenty pounds weight of onion seed was sent from a friend in Germany. Instead of packing it in hermetically sealed bottles, he stowed it in calico bags in the body of an immense wooden Swiss cuckoo clock. When the clock was opened the bags of seed were examined and looked perfect in colour and shape; but, alas! when subjected to pressure, no oily fatness was perceived; and when at last it was given a chance and sown thickly in drills, 5 acres returned the magnificent yield of 72 lb., which, at the rate of £28 per ton, amounted to 18s. Certainly, the land, after a week's waiting for the seed to germinate, was utilised otherwise, but not 1 cwt. of onions was harvested.

Make sure, therefore, of the seed. After sowing, it should germinate in less than a week.

In former days large onions were always aimed at, but now the public taste is in favour of medium-sized bulbs, so that closer planting may be adopted.

Onions may be known to be ripe by the drying up of the tops. As soon as this happens, take them up by hand and leave them on the ground between the rows to dry. As soon as they are dry, carry them carefully with as little bruising as possible to the barn.

As before stated, the Brown Spanish has proved most successful in this State, but the gentleman above mentioned grew what they called the large White Portugal onion. It certainly was a splendid bulb, and fetched very high prices in the markets of Brisbane, Maryborough, and Rockhampton.

WATER.

The question of water supply, especially in droughty seasons, is one of paramount importance to everyone, and it is, therefore, easy to appreciate the principle of law which says that the flow of water must not be diverted, polluted, obstructed, or diminished by occupiers higher up the stream. In the words of Mr. Justice Farwell, in a recent case:—"The rights in relation to water flowing in a defined and known channel on or under the surface of the earth are now well settled. Every riparian proprietor has an equal right to the ordinary use of the water which flows in the stream adjacent to his land, as it has been wont to run." This law of running water is said to derive its origin from the fact that the right enjoyed by the several proprietors of the lands over which the water flows is, and always has been, public and notorious. There is no difficulty in enforcing the right, because running water is something visible, and no one can interrupt it without knowing whether he does or does not do injury to those who are above or below him.

Water naturally descends, and, if stopped, will make a way for itself. The upper and lower owners each have their rights. If the upper owner dams the stream, the lower owner loses the passage of the water; if the lower owner dams the stream, he floods the higher owner's land. It is obvious to all that the water in the known and definite channel runs towards the lower ground; therefore each owner must refrain from interfering with this channel, thereby avoiding injuring the other and escaping injury to himself.

Note, however, that there is a great distinction between streams which are known and defined, whether on the surface or underground, and underground streams which merely percolate through the soil in unknown channels. In each of these cases the natural right to purity of the water is the same, and to pollute the water, whether flowing or percolating, is an actionable wrong. Thus, two adjoining owners had each a deep well on his land, but plaintiff's well was at a lower level than defendant's well. The defendant turned sewage from his house into his well, and thus polluted the water that percolated underground to the plaintiff's well. In these circumstances the plaintiff had no difficulty in getting an injunction to restrain the pollution. But the natural right to an uninterrupted flow of the water exists only when the stream runs in a known and definite channel above or below ground, and does not extend to water merely percolating in unknown or undefined streams below the surface, or to common surface water rising out of springy or boggy ground and flowing in no definite channel. Therefore, when a landowner and millowner, who had for over sixty years enjoyed the use of a stream which was chiefly supplied by such percolating underground water, lost the use of the stream after an adjoining owner had dug on his own ground an extensive well, for the purpose of supplying water to the inhabitants of the district (many of whom had no title as landowners to the use of the water), it was held that the millowner had no right of action.

But supposing the existence of a definite underground channel to be conceded, what is the position if its course is unknown? This puzzling question had never come before the English courts until this year, when it arose under the following circumstances:—The Corporation of Bradford were the owners of certain mills upon the Morton Beck, in the West Riding. Mr. William Ferrand was the owner of a moorland allotment containing a certain spring, known as the Sweet Well Spring, which was one of the principal feeders of Morton Beck. Mr. Ferrand granted permission to Shipley Urban District Council to sink certain shafts and wells close to the Sweet Well Spring. The Bradford Corporation alleged that the sinking of these shafts had materially diminished the flow of the spring, and they commenced an action for injunction to restrain the interception of the customary volume of water.

It was believed that the waters that issued from the spring flowed previous to their emergence at the surface by a well-defined and ascertainable channel

under the surface of the ground. This belief, however, rested rather on abstruse scientific inference than on ascertained fact, and the Corporation sought power to enter on the land to make the observations, experiments, and excavations necessary definitely to ascertain whether the waters of the spring did or did not, as a matter of fact, flow in a well-defined channel previous to their emergence into the open.

The Court, however, refused permission, on the ground that it was doubtful whether the Corporation could succeed in the litigation if the existence of a defined channel could only be ascertained by excavations, and that, under those circumstances, it would be improper to allow the Corporation to make the explorations they desired until the following point of law raised by the defence had been disposed of, viz.:—"Assuming that underground water flows, or flowed, to the Sweet Well Spring in a defined channel, but that the existence and course of that defined channel is not, and cannot be, ascertained or known, except by excavation of the soil, the plaintiffs have no right of action for the abstraction of such underground water, and are not entitled to maintain this action."

The case was argued at considerable length, and, after much learning and research had been brought to bear on either side, Mr. Justice Farwell, in a luminous judgment, reviewed the law. Applying his conclusions to the facts before him, he found in favour of the defendants, holding that there is no right in lower riparian owners to water flowing in an upper defined underground channel, unless the course of such channel is known, or can, at any rate, be easily and inevitably inferred, without recourse to exploratory excavations. In such cases it is obvious that the flow of the water has not been public or notorious.—"Mark Lane Express."

ADELAIDE SEWAGE FARM.

Long ago there was much talk about establishing a sewage farm near Brisbane, and once more the subject is being mooted. Vast quantities of material, which, if properly treated, would in time yield a handsome revenue to the Municipality, are daily being carted away at heavy expense and dumped into the sea. The following account of the Islington Sewage Farm, near Adelaide, is interesting reading. We are indebted for the article to "Garden and Field":—

A VALUABLE GOVERNMENT INSTITUTION.

One of the most important aids for placing the city of Adelaide ahead of all the Australian cities is the manner in which the health of the people is cared for by the excellent system of deep drainage, finally carried out at the Islington farm, where the whole sewage is satisfactorily dealt with.

A very pleasant hour can be passed under the guidance of the well-known genial manager (Mr. B. Hack), who, through the common-sense wisdom of the Government, was not allowed to retire whilst in the full vigour of life and when his experience was more valuable than it ever had been. The disposal of the sewage water, the arrangements of the paddocks, the useful silo by which large quantities of forage is preserved for use or sale as may be best determined, a fine herd of Berkshire pigs in well-arranged quarters, and a general sight of live stock on the farm will well repay the visitor. The following concise report by the Hydraulic Engineer will place the reader in full possession of the use, management, and resources of the farm, and of the practical manner in which the sewage of a city is disposed of for the health of the public and the advantage of the State:—

The sewage farm, which receives the sewage from the city of Adelaide and suburbs, is situated about 4 miles north from the general post office. The level of the ground at the straining sheds, where the sewage enters the farm, is 113 feet below that at the post office, being 41 feet above sea level.

Sewage was first distributed on the farm early in 1881, and up to the present time it has been satisfactorily dealt with by means of broad irrigation combined with intermittent and downward filtration. The sewage is strained before being applied to the land, and is conveyed to the straining sheds by two main sewers, with a maximum discharging capacity of 24,000 gallons per minute, the average daily flow being 2,083 gallons per minute, which, however, is considerably exceeded in wet weather, owing to the practical impossibility of excluding all storm water from the sewers.

The number of houses now drained is 24,000, representing a population of about 110,000, and the total length of main sewers throughout the city and suburbs is about 242½ miles.

The area of the farm is 628 acres, 57 of which are leased at an annual rental of £10 per acre; 442 acres are irrigated, and the balance comprises roads, plantations, and land which has not yet been graded or irrigated.

The irrigated land has been subdivided into 24 paddocks varying in size from 8 to 25 acres, and the sewage is distributed on the land after it has been properly graded, and, where necessary, underdrained by means of 1½ miles of concrete channel and 26 miles of wooden fluming of various sizes. All the paddocks are properly fenced and provided with an ample water supply from the city mains.

There is also an orchard containing 18 acres, planted with oranges, apricots, peaches, pears, &c., all of which are in full bearing; a large quantity of vegetables of various kinds is also grown among the fruit trees, but the profit from this portion of the farm is small compared with that derived from the grazing paddocks.

In addition to the sewage distributed on the farm, effluent water amounting to about 1,000,000 gallons per day is, during the summer months, pumped back into the flumes by means of an 8-inch centrifugal pump, at a cost not exceeding ¼d. per 1,000 gallons. This is of considerable value in irrigating the lucerne and other growing crops.

Crops of almost every description have been grown on the farm with marvellously good results. The chief grasses are prairie, rye, and panicum, and these have proved best for grazing. Lucerne, sorghum, maize, mustard, and mangolds are also largely grown; some of the mangold crops have been exceedingly heavy, and have frequently reached 40 tons per acre—the maximum was 80 tons per acre.

A large quantity of ensilage is made annually from spare green feed, such as Cape weed, Italian rye grass, prairie grass, &c., and in dry seasons this is readily disposed of at from 15s. to £1 per ton. It is also used at times for feeding stock on the farm.

The crops of sorghum, maize, mangolds, lucerne, panicum, and rye grass are watered with sewage every three weeks. Three inches in depth is sufficient, but, as a matter of fact, considerably more than this is put on to the paddocks, owing to the loss in distribution and the porous nature of the soil, which, on the western portion of the farm, consists of sandy loam overlying a gravelly subsoil. The eastern portion is of a stiff loam and clay. Great care has to be exercised in irrigating any crop with sewage, and the application of effluent water to newly seeded land has proved its superiority over sewage, but when the crop has become well established the result from sewage irrigation is, of course, far superior.

In addition to a large grazing contract with the Co-operative Society, who have the right to graze 90 head of cattle per day for a consideration of £450 per annum, a similar number of cows are grazed for various dairymen at 2s. 6d. per head per week; horses are also depastured for 3s. to 4s. per head per week. The total receipts for grazing for the year ending 30th June, 1906, were £1,645. A large business is also done in fattening cattle and sheep, the profits for the same period being £1,467. The number of horses, cows, and other

cattle on the farm at the present time is 412. There are also 300 sheep and 160 lambs.

Pig-breeding is carried on profitably, and, although many varieties have been experimented with, Berkshires have proved the best.

Adelaide can fairly lay claim to having a sewage farm—the first introduced into the States—second to none in the world. The sewage has always been satisfactorily disposed of, which is the first consideration, and, although there are many dwellings in the vicinity, there is no nuisance and no complaints are now received, all prejudice having been overcome owing to the satisfactory manner in which the farm has been worked.

The manager (Mr. B. Hack) is charged 12s. per acre per annum rent, 5 per cent. on capital, and has to maintain all buildings, flumes, fences, farm implements, &c. For the past ten years an average profit of £281 per annum has been made, and when it is remembered that farming operations are carried out under the eight-hours system, and that all the drainage of the city and suburbs has been satisfactorily disposed of, it reflects great credit not only on the present management, but also on the authorities who first decided the system should be introduced into Adelaide and those who carried out the works.

CULTIVATION OF ARID LANDS.

The "Campbell" System of Tillage.

On this subject, which we discussed at some length in a previous issue of the Journal, "The Pacific Rural Press" says:—

"An item of interest in this connection is that the directors of the Riverside (California) Chamber of Commerce have decided to raise funds to defray the expenses of a careful examination of the soil in the semi-arid valleys in the country, to determine whether the conditions are favourable to the adoption of the Campbell system of soil culture and cultivation. It is believed that if the new method is applicable to the conditions presented in the Perris, San Jacinto, Moreno, and Menifee Valleys the fortunes of the men who have allied themselves with the growth of those sections will take a turn for the better. H. W. Campbell will make the examination in person. What Mr. Campbell can tell by such examination will be interesting, of course, but it ought to be understood that his philosophy of tillage was demonstrated in California nearly half a century before he announced it. What is needed is a trial of the implements which he has designed to reduce that philosophy to practice. We know perfectly already that cultivation will conserve moisture, and that 'firm below and loose above' underlies all our success in fruit-growing. Now, we want to know if he can apply it to field crops profitably."

NOVEL METHOD OF AGRICULTURAL EDUCATION.

The "Experiment Station Record," U.S.A., describes a novel experiment in connection with agricultural instruction in the United States:—A special train of four cars was equipped with apparatus and exhibits illustrative of farm crops, fertilisers, animal husbandry, dairying, horticulture, entomology, and forestry. Forty-minute stops were made at stations along the route, the first twenty minutes being devoted to two terse ten-minute talks in each car, followed by twenty minutes for viewing the exhibits and asking questions. The undertaking was pronounced a great success from start to finish. It is estimated that about 25,000 people visited the train during its course.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 31ST JANUARY, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Cocoa ...	Jersey	13 Dec., 1906	1,004	4·8	53·97	
No. 48 ...	Ayrshire Sh'rth'rn	30 Nov. „	900	4·1	41·32	
Whitefoot ...	Holstein Sh'rth'rn	7 Nov. „	994	3·7	41·19	
Careless ...	Jersey	2 Nov. „	853	4·3	41·08	
Dot ...	Shorthorn ...	18 Aug. „	759	4·8	40·08	
Dripping ...	Holstein Sh'rth'rn	28 Nov. „	929	3·8	39·53	
Linda ..	Ayrshire ...	12 Nov. „	905	4·0	40·54	
Carrie ...	Jersey	3 Dec. „	821	4·2	38·62	
Count ...	Shorthorn ...	20 Nov. „	933	3·6	37·61	
Rosebud ...	Ayrshire ...	3 Sept. „	754	4·4	37·15	
Blanche ...	„	18 Nov. „	752	4·2	35·37	
Wonder ...	Shorthorn ...	7 Dec. „	874	3·6	35·23	First calf
Bee ...	Jersey	27 Dec. „	700	4·4	34·49	Six days allowed before milk was recorded
May	Shorthorn ...	31 Oct. „	827	3·7	34·27	
Cuckoo ...	Jersey	27 Dec. „	691	4·3	33·27	Six days allowed for colostrum
Honeycomb	Shorthorn ...	19 July „	657	4·4	32·37	
Bliss ...	Jersey	3 May „	542	5·0	30·35	
Dora ...	Shorthorn ...	29 May „	676	4·0	30·28	
Nambour ...	Holstein Sh'rth'rn	21 Nov. „	738	3·6	29·75	
Friz ...	Shorthorn ...	30 Oct. „	746	3·5	29·24	
Winnie ...	„	11 Sept. „	814	3·5	31·90	
Mona ...	Holstein Sh'rth'rn	16 Jan. „	722	3·8	30·72	
Pleasant ...	Shorthorn ...	9 Nov. „	824	3·3	30·45	
Restive ...	„	3 Aug. „	645	4·0	28·89	
Remit ...	Holstein Ayrshire	19 Nov. „	726	3·5	28·45	First calf
Noreen ...	Holstein Sh'rt'hn	3 Oct. „	708	3·6	28·54	First calf
Belle ...	Jersey	4 Oct. „	619	4·0	27·73	
Bangle ...	Shorthorn ...	31 Dec. „	633	3·9	27·65	Six days allowed for colostrum
Graceful ...	Guernsey Sh'rt'rn	1 Dec. „	705	3·5	27·63	First calf
Butter ...	Shorthorn ...	11 Aug. „	685	3·6	27·62	
Gin ...	„	1 Jan., 1907	615	4·0	27·55	Six days allowed for colostrum
Gem ...	„	29 July, 1906	680	3·6	27·41	
Angel ...	Holstein-Devon	11 April „	577	4·2	27·14	
Haze ...	Ayrshire Sh rth'rn	16 Aug. „	656	3·6	26·45	
Rosalie ...	Ayrshire (Imp.)...	5 July „	581	4·0	26·02	
Magpie ...	Holstein Sh'rth'rn	4 Feb. „	643	3·6	25·92	
Lottie ...	Ayrshire ...	7 July „	545	4·1	25·02	
Dollie ...	Shorthorn ...	31 July „	588	3·8	25·02	

The above gives the record of all cows giving over 25 lb. commercial butter for January, 1907.

FEEDING THE SOW TO FEED THE YOUNG PIG.

The question whether a pound of feed goes farther when fed directly to young pigs or when first fed to the dam is an interesting one to the stockman, says Professor Henry in his interesting work, "Feeds and Feeding." The writer has conducted trials with eight litters of pigs, noting feed and gains, for information on this subject. In all cases the pigs and dams were weighed

separately each week, and record kept of the food eaten by each sow and her litter before weaning, and of the pigs after weaning. The pigs were taught to eat at an early date, and encouraged to do so by placing food in a trough where it was accessible to them, but not to the dam. The feed consisted of corn meal, middlings, oats, barley, and skim milk. At ten weeks the pigs were weaned, the feeding continuing for seven weeks. We were thus enabled to measure the feed required for gain by the sows and pigs before weaning, and by the same pigs after weaning. In all cases the loss in weight by the sow when suckling her young is taken into account, the results reported being the net gains after deducting such loss. Below is a table showing feed required for 100 lb. of gain with sow and pigs before weaning, and by the same pigs after weaning. The numbers refer to the lots:—

	Before Weaning.		After Weaning.	
	Meal.	Milk.	Meal.	Milk.
1	241	563	251	587
2	288	649	215	577
3	198	654	213	449
4	240	528	177	542
5	184	482	187	562
6	254	509	251	502
7	235	474	259	518
8	208	416	286	571
Average ...	231	534	230	539

It will be seen that the sow and pigs together, before weaning, and the pigs alone after weaning, required almost identical quantities of milk and meal for the production of 100 lb. net gain. At first thought it appears impossible that as good gains can be secured with young pigs from a given amount of feed administered through the sow as can be obtained by direct feeding. A possible explanation lies in the fact that the body of the very young pig contains a large proportion of water, so that less dry matter is required for a pound of gain than with older animals. Again, each pound of flesh lost by the dam during this time may have yielded more than a pound of increase with the young.

SMOKING BACON.

A simple rough-and-ready device for smoking bacon is sent by a correspondent to the New South Wales Department of Agriculture. The outfit consists of a large hollow log, a case, or a cask. If a log is used, cut off a piece about 4 feet in length, stand it on end, and drive a few nails around the top, inside, to hang the hams and shoulders on; then drive two forked sticks into the ground inside the log, one on each side; put a stick across, resting on the forked sticks, and upon this place two hooks—one at each end—upon which to hang two sides of bacon. With an inch auger bore a hole near the bottom, and when the pork is hung inside cover the top with two or three thicknesses of bagging. If the log is stood out of doors, a sheet of iron will be required for shelter in case of rain. Having everything in readiness, get a cold-blast smoker (obtainable at any leading ironmonger's), charge it with dozy—*i.e.*, slow-burning smoky wood—and force the smoke through the auger hole in the log for about five minutes at a time three or four times during the day. A plug should be placed in the hole after each smoking. At the expiration of three or four days, the bacon will be nicely browned and ready to take out.

Poultry.

SUCCESSFUL POULTRY FARMING.

There are many reasons advanced why poultry farming on a large scale will not pay in Queensland. It is certain that many have tried it here and have failed. An English writer says the same of poultry farming in the United Kingdom, and in an article published in the "Agricultural Gazette" he says:—

The big commercial egg farm depending entirely for its profits on the sale of eggs for table seems an impossibility in this country. It has been tried, and failed invariably; not only so, it has discredited poultry farming, so-called, in the eyes of a great many people. Yet the big commercial egg farm flourishes in the United States. There are some critics who declare that this is nonsense, but such I should refer to the report on the poultry industry in America, written by Mr. Edward Brown, published by the National Poultry Organisation Society. The question then arises, Can we successfully imitate American methods and keep several thousand laying hens on land devoted entirely to them? I think not, but let us consider the differences between the conditions influencing egg farming there and here.

In the first place, the question of rent is all in the favour of the American. In the West land can be bought at a nominal figure, while in the East it is purchasable, freehold, at a couple of pounds an acre. Thus, while an Englishman hiring a farm of 60 acres would have to pay about £60 a year, the American would buy the land for about £120, which means, at 5 per cent., £6 a year for rent instead of £60. But this benefit is practically equalised by the increased cost of hiring labour and building or buying houses and "plant" generally.

The Price.

It is not in being able to produce the eggs more cheaply that the American has the advantage, but chiefly in the increased price he gets. The big egg farm only flourishes on the east side of the United States, the more thickly populated side; there is there an enormous demand for eggs, and it is not met by the average farmer, who, even less than the farmer here, does not trouble himself about poultry. The small poultry-keeper—I mean the man keeping a few fowls only—who is so important a factor of the poultry industry here is unknown in America, hence the need of specially organised establishments to meet the demand for eggs. Such an establishment, too, has no need of a middleman to effect sales; it can deal direct with shops and hotels, and this is, of course, an important point. And then the prices they obtain are far superior to what we can get. Listen to these figures concerning the Lakewood Poultry Farm in New Jersey. It has been established seven years, and the capital sunk in it amounts to 20,000 dollars, say £4,000; last year the profit was 7,000 dollars (£1,400). The extent of the farm is 60 acres, and the only breed kept are White Leghorns. There are 4,000 laying hens, and it is intended to raise the number to 7,000. New York likes white-shelled eggs better than brown, hence the choice of Leghorns. The yearly egg average has been increased from 90 to 169 for the one-year-old hens. The eggs are sold chiefly by contract, the prices they fetch varying from 1s. 4d. per dozen to 2s. 6d. in the winter months.

Sitting Egg and Chicken Trade.

Handsome as the profit must be at selling eggs at such prices, the critic who has read the above paragraph will doubtless point out that even if 2d. an egg is made it is not clear how 4,000 hens can show a yearly profit of £1,400.

This is true, but the reputation of the Lakewood Poultry Farm has spread, and there is a big sale done for eggs for hatching and day-old chickens. Of the latter, 15,000 have been sold. The surplus cockerels are sold as squab broilers when they weigh ¾-lb. But, profitable as the sale of sittings of eggs and day-old chickens is, the proprietor only regards them as a side branch; the fame of the establishment has been built up as an egg farm—the profit by the side branch has come, as it were, automatically.

Another successful egg farm is that of the Woodlands Poultry Farm, near Philadelphia; 30,000 dollars is sunk in this establishment, which is 62 acres in extent, and which was purchased at an almost nominal cost. There are on this farm between 4,000 and 5,000 hens, and it is intended to raise the number to 10,000. The chief product is eggs, which are sold to hotels at New York; 150 dozen a day were being sent off when Mr. Brown visited the farm. Here, again, there is a considerable sale of eggs for hatching, 140,000 having been disposed of last season in this way, and 1,200 pullets were sold for 10s. each. Huge as these figures are, the cost is proportionate; the fowls cost 6s. each per annum for food, and the labour question adds considerably to the expense of maintenance. The manager estimates that labour costs 2s. per head of laying stock, exclusive of office management—viz., bookkeeping, &c.

TAINTING OF THE SOIL.

One of the great difficulties poultry farmers in the past have had to contend with is the tainting of the soil, as the result of keeping fowls thickly upon it. In America this problem is not nearly so difficult—first, because the soil usually employed for poultry is of a light, sandy nature, and the manure is washed through it; secondly, the summers are hot and dry, and the winters long and cold, the ground being covered with snow. In summer, then, the manure dries up rapidly, while in winter it is frozen hard, and can be easily removed. For half the year and more the manure is not active, while with us, unless the summer is extra dry or the winter extra cold, the manure is active the year round. But, even as it is, in America they have been overcrowding their fowls, and disease is appearing in consequence. Mr. Brown gives a list of successful egg and table poultry farms he visited, but these are the survivors of many failures, and when they fail in the States it does not mean the loss of one, or two, or three hundred pounds, but a figure nearer a thousand at least. They do things there, we see, on a bigger scale, and so, if they fail, they lose more money than we do.

NOTES ON STOCK DUCKS.

The demand for early ducklings on the London and other first-class markets increases, says the "London Agricultural Gazette," year by year, and excellent prices are always procurable during the spring months. Until recently the supply has been in the hands of specialists who devoted their whole time to the production of this class of poultry, but farmers are now beginning to realise what excellent opportunities they have in this direction, and how profitable a trade it is. Thus we find that many are turning their attention to this branch of poultry keeping, and certainly it is one that can be confidently recommended. The great difficulty, of course, is to procure a regular supply of eggs during the winter months, because, unless this can be accomplished, failure is bound to ensue. There are a good many points that have a very material effect upon the egg supply, chief among which is the time of year the stock ducks are hatched. Early birds have to be depended upon—ones that have been hatched about the previous April—because ducks do not generally commence to lay until they are about six to seven months old. The present is not the time, however, to discuss this point, but it should be borne in mind next spring.

The feeding of the stock ducks plays a very important part in determining the supply of eggs, as unless suitable food is given to the birds they will not obtain the requisite ingredients for the formation of eggs. When the weather is at all cold, the first feed of the day should consist of mash with the chill taken off; on no account should it be supplied cold, because if a quantity of cold water is taken into the system it represents a considerable waste of animal heat, which has the effect of reducing the yield of eggs. The mash should consist of meals, together with household scraps or a little farm or garden refuse, cooked or well soaked. For winter use, barley meal is perhaps the most suitable; but it is advisable, in order to obtain a fairly well-balanced ration, to use a mixture. A little maize meal may be employed with good results, as, although a bad food alone, when used in conjunction with others its effect is beneficial. The following is a good preparation and can be recommended:—Three parts barley meal, two middlings, one maize meal; and during fine open weather one part bran, together with what scraps there may happen to be. If the latter are unobtainable, half-part of granulated or lean meat should be substituted. Some breeders use grain for the afternoon feeding, but I have always had better results by repeating the morning's preparation of mash. If grains are used, the most suitable are oats, wheat, and a little maize.

Ducks are hardy birds, and do not require elaborate houses, but they must be kept warm, dry, and free from draughts. It stands to reason that if the food has to be utilised for maintaining the temperature of the body there will be a correspondingly smaller amount for the production of eggs. Upon many farms there is a shed which makes an excellent sleeping place for ducks; if it has a cement floor, as frequently happens, it requires to be thickly covered with litter, in order to overcome the coldness. The best floor is the ground itself, well littered with straw or dried leaves or bracken; peat moss, though often employed, is unsuitable, as it so speedily becomes wet and foul. If no shed is available, then a wooden structure should be erected, made of inch boarding, which should fit together well, in order to exclude draughts. It does not require to be more than 3 feet 6 inches to 4 feet high, as ducks sleep on the ground and do not perch. If placed near a stream or pond, great care must be exercised that it is built well above the level of the water, as nothing proves more fatal to the health and well-being of the ducks than dampness in their sleeping quarters.

USEFUL HINTS FOR THE POULTRY-KEEPER.

A setting of eggs will give you intact a share of the best blood in the State, and produce an extra fine pen of fowls. Provided you are willing to sell.

All or nearly all the people who are ex-poultry-keepers hold to the belief that they could make a success of it instead of a failure if they had the chance to try again.

Light and pure air in the poultry-house is an absolute necessity, and the inmates must have it to be in a healthy and cheerful condition, for fowls will not thrive in a dark and cheerless place any more than plants will.

If the penalty for selling decayed eggs were a heavy fine or a six months' holiday in Boggo Road, a vast crowd of tradespeople, who don't know how to tell a good egg from a bad one, would speedily discover a way to do it.

Hens that lay eggs that have blood spots in them would be benefited by homœpathetic pulsatilla. Find out the hen that lays such eggs, pen her separate, and give ten drops of the first dilution in half a pint of drinking water and feed non-stimulating food. There is inflammation in the oviduct.

The warning cannot be too often repeated not to give the medicines in drinking water contained in metallic vessels. Not to dose a whole flock to cure a few sick individuals, and not to use tin drinking vessels. Glazed or earthenware fountains make the best drinking vessels for poultry.

Highly fed chickens which grow fast are mostly subject to leg weakness, which simply arises from outgrowing their strength, and must be met accordingly by animal food and tonics. Three or four grains of ammonia citrate of iron for each chicken given every day dissolved in the water in which their meal is mixed.

When chicks die in the shell, the chances may be that too much draught of air came over them. When a hen is hatching, she will fight if even a feather is lifted from her. She will allow not the slightest change of temperature, and she will hatch as well in a dry place as in a moist location; hence never open the egg-drawer except to turn the eggs.

FRESH *VERSUS* DRY BONE AND MEAT FOR POULTRY FOOD.

It is unnecessary to devote space or time to the discussion of the value of raw bone and meat in the feeding ration of poultry. There can be no question as to its prime importance for both eggs and muscle. If there be whys and wherefores, study them at your leisure, but the fact remains, and the average practical poultryman and farmer will be satisfied with nothing short of facts. People who keep poultry want eggs when eggs bring the highest price, and they want to produce them at the least possible cost, and they must not forget that it is important to maintain the health of their flock and promote its growth. Every year people are demonstrating to their own satisfaction that raw bone, meat, and gristle accomplish a result not obtained by the use of any other food.

Watch the hen who has her liberty. Which does she prefer—a live, juicy bug or a dried-up one? It is raw animal food she relishes, and it does her good; and it is raw meat and bone, not cooked or dried, which makes her lay eggs. The protein in the raw food is more digestible than that in the dried or cooked food; she gets more out of it. Her system assimilates it all. But of greater importance is the fact that this raw food has a peculiar effect upon the hen. It makes her vigorous and active. It keeps her in health. It beautifies her plumage. It makes her eggs more fertile. It makes her offspring stronger, gives them more rapid growth, enables them to resist disease, and thus enhances the value not only of the hen, but of her progeny as well. Experiments everywhere have demonstrated the facts that cooked or dried foods are inferior in every way to raw bone and meat.

Fowls demand raw animal food. Watch your hens in the summer time, and you will see them chase across an acre of ground to obtain a nice, fresh bug or worm, and when hens get this kind of food in abundance they furnish an abundant supply of eggs. It is the owner's business to supply his fowls with raw animal food in the winter season, for he cannot obtain best results if he neglects this. Properly cut green bone with meat and gristle attached supplies this food in the best possible form.

The most important elements in the egg production are the nitrogenous substances which are grouped together under the name "protein." Now, raw bone and meat are especially rich in protein. Raw bone and meat furnish the hen with the proper material from which to make eggs at the lowest cost. But this is not all, neither is it the most important fact in estimating food values. There is protein in wheat and dried meat meal. Yet the hen will not lay as many eggs when fed these foods as when fed fresh cut bone. This is not a theory, but a fact demonstrated many times in poultry yards and by experiment stations.

The proper use of this material ensures more eggs, more fertile eggs, a better hatch, more vigorous chicks, produces broilers quicker, makes pullets lay earlier, stops egg-eating, ensures the flock against many ills, saves money in the grain bill, and makes every hen a paying hen.—"Poultry Gazette."

FARM—POULTRY.

OBJECTS.

In poultry-raising, as in any other branch of stock-raising or agriculture, the grower must have a definite object in view if success is expected.

The object of this paper is not to advocate the raising of poultry as the sole aim of the grower, but to show how it can be profitably run as a side issue to the various methods of farming, such as general farming, dairying, fruit-growing, &c.

In any of the above cases, the systematic raising of poultry can be made to fit in with the ordinary methods adopted.

The first thing necessary is for the farmer to make up his mind which branch of the industry he intends following up—*i.e.*, whether egg-production or the growing of table poultry.

To arrive at a determination in this matter, location must be considered. By location I mean the position with reference to markets.

If handy to railway, either branch or both can be run. If the farm is situated at a greater distance, egg-farming would, I believe, prove the better side to follow. In fact, taking it all round, I am of opinion that in Queensland, egg-farming will always prove the more profitable side of the industry.

EGG-PRODUCTION.

In view of the certainty in the near future of the establishment of a good trade in the export of eggs to the home market during our egg harvest, egg-production will become one of our main industries.

We possess an ideal climate for this branch of the industry. There is not a month in the year that a hen, if given free range on the average farm, cannot earn her own living and add to the profit of the farm. This was proved during our dry spell. When a shrinkage was shown all round on the products, the humble hen came out of the trial with good results.

It has been said by pessimistic writers that our climate was far too hot for successful poultry farming. The absurdity of this contention may be seen by anyone turning to the market reports; they will find that during our worst months, so far as heat is concerned, our birds are turning out their highest averages. A glance at the results of Gatton College laying competition will prove this to anyone interested; and, if the grower cares to go even further afield for proof of the suitability of our State for egg-production, a comparison of results of the several competitions being held all over the Commonwealth will show that Queensland birds can more than hold their own, particularly during the hot months.

TABLE OR EXPORT POULTRY.

The success of our trial shipments to London shows that poultry can be exported profitably.

Though not caring to recommend the growing of poultry for table or export solely, I am sure that the poultry farmer should not neglect this side of the business. In the case of the egg-farmer, he must of necessity raise a large number of cockerels, which, if of a suitable kind, will find a ready market in England, at very good prices.

The advent of the "general purpose hen" has done a great deal to improve the table qualities, as birds of a real good laying strain can also produce good table birds. The suitable breeds will be mentioned at a later date, together with their qualities, as laying or table fowls.

SITUATION.

Having decided on embarking on either or both sides of the business, the situation of the poultry yards is the first consideration. It has to be decided whether the birds are to be given—

1st.—Free range—*i.e.*, the free run of the farm;
2nd.—Partial—kept in runs partly, and allowed free range occasionally;
3rd.—Kept in runs—kept in enclosures constantly.

I must again refer the reader to any or all of the laying competition results. These prove that birds kept in small lots in small areas give the best results. It will pay the grower for the little extra cost of yarding his fowls.

The argument in favour of free range is, that the birds can do for themselves. That is, of course, true. If the grower cannot give his birds every-day attention, then free range will suit him best, but he cannot expect the same results as from a lot of birds that are given every attention and kept in small lots.

The breeder must figure it out for himself, and decide which of the systems will suit his particular case.

Having decided, the next question is the housing of the birds. This can be of the simplest style; I prefer the small movable house, open-fronted.

Here, again, local conditions play a part, as in some districts vermin, such as native cats, &c., make havoc if the house is not securely wired in and floored. Description and plates will be given when dealing fully on housing later on.

SOIL.

The general situation should, if possible, be facing east or north-east, the ideal position being a gentle easterly slope. Still, they will get along where these conditions are not possible. I have found poultry doing well on our heavy blacksoil plains. In the latter case, growers should, if possible, select a small spot a little higher than the surrounding ground, even if only large enough for the fowlhouse. Poultry can be run on very poor country, a sandy soil being best. There is a wide range of choice between the sandy and the heavy black soils, but a happy medium is more often met with.

HOW TO START.

The question is often asked, How much capital is necessary to start poultry farming? It depends exactly on the extent to which it is intended. A beginner can start on practically no capital, if engaged in other branches of farm work, while the young stock is growing.

PURE BREEDS *v.* MONGRELS.

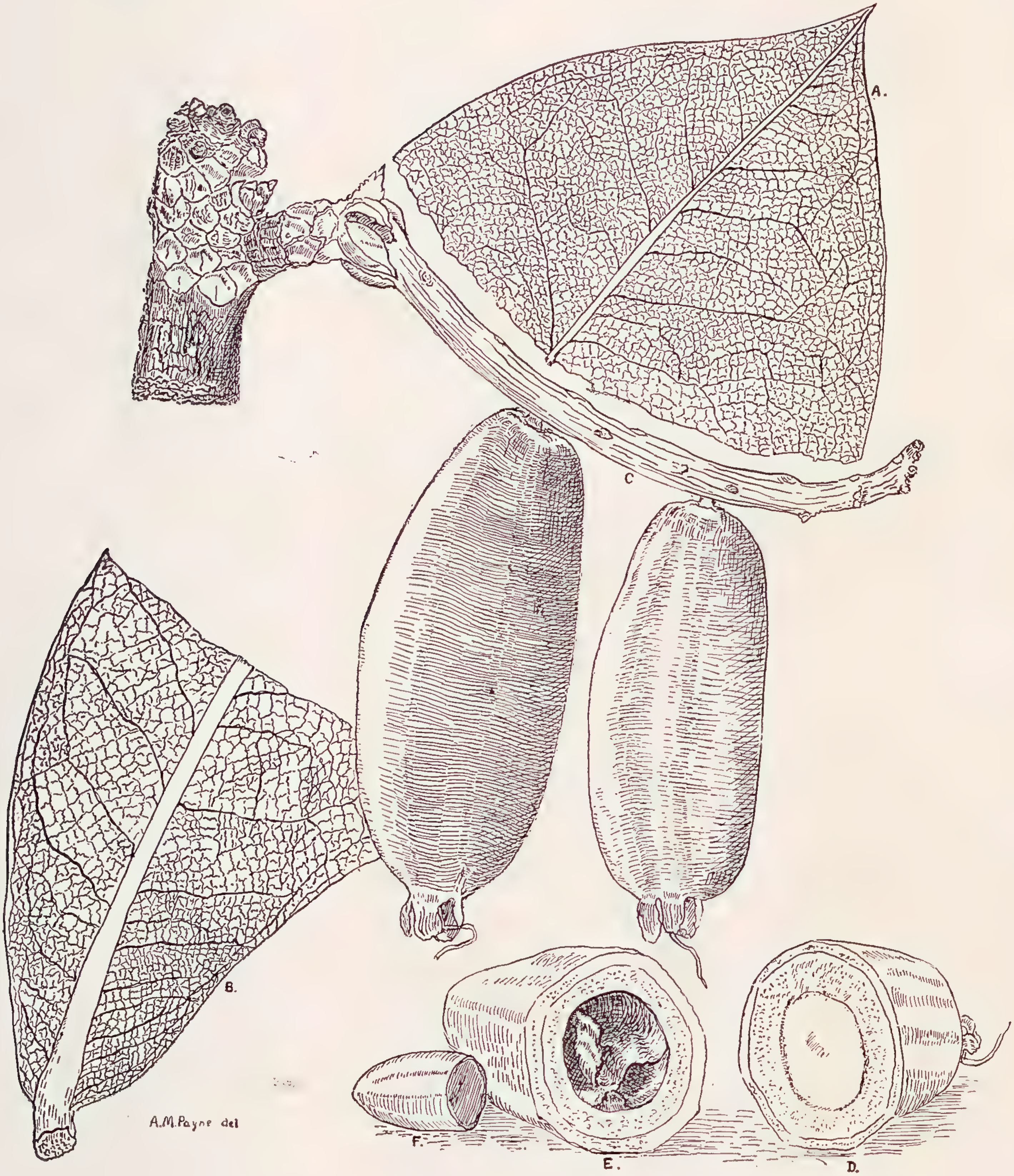
It will not be out of place here to warn beginners against starting with mongrels, that take up the same time and space and the same amount of food as the purebred bird. By purebred I do not necessarily mean a *show* bird. The class of bird that pays best is the bird that has been carefully bred for generations, with all the useful qualities handed down. This must appeal to the intelligent farmer, who knows that, if he is a wheat-grower, he must select the very best seed available. If a dairy farmer, he selects only stock from pedigree milkers; so in poultry farming laying qualities are bred by careful selection from pedigree laying stock. Is it reasonable to suppose that a mongrel that has been produced by haphazard means can compare with a bird that is the production of careful mating of pedigree laying stock? The fact is so patent that I will not take up any further space with an argument that must be so plain to even the beginner.

I would advise all intending to start, or those who already have stock and are anxious to improve, to purchase stock or eggs from known producers.

For choice, I would recommend the purchase of stock rather than eggs, for this reason: That it only means a little more outlay, and you have a whole season start, as in the case of purchasing eggs you have all the risks attending the hatching and the rearing of chickens, that are not available as breeders till the following season. If you purchase, say, a trio of birds, they will soon lay their value in eggs, and are good for several seasons, depending, of course, on age when purchased.

If the beginner cannot afford to purchase stock, then by all means buy eggs from pedigree stock and start on a fair basis. The day of the mongrel is past; like the stage coach, he has served his turn, and must bow to the inevitable.

Plate XI.



Barringtonia edulis, Seem.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order MYRTACEÆ.

TRIBE LECYTHIDEÆ.

BARRINGTONIA, Forst.

B. edulis, *Seem.* Fl. Vit. 82. "Vutu Kana" of Fiji. (Plate XI). A small tree, glabrous, except for a thin greyish tomentum on the apex of the stout branchlets, peduncles, and bracts. Leaves oblong-cuneate or broad-lanceolate, 10 to 17 in. long, 4 to 6 in. broad above the middle, margins quite entire, texture thin, glossy on both faces, lateral nerves rather distant, prominent, midrib stout, apex apiculate, almost or quite sessile. Flowers in terminal spikes 10 to 13 in. long. Rhachis stout, more or less deeply striate, probably when young thinly tomentose. (No petals or stamens seen.) Calyx persistent on the fruit, deeply divided into irregular, broad, concave lobes, with numerous branching nerves, 4 to 6 lines long. Style subulate, about 1 in. long, more or less grooved and green. Bracts cordate-acuminate, the lowest rotundate-apiculate, 3 to 6 lines long, veins prominent. Fruit about 3 in. long, 1½ in. diam., smooth, the angles scarcely observable; exocarp purple; sarcocarp green, 1 or more lines thick; endocarp fibrous; 4-celled, the septa or dissepiments white, almost membranous, like those of an orange, one cell almost obliterated, two empty, the other maturing an oblong seed about 1½ in. long, ¾ in. diam.

EXPLANATION OF PLATE.

A. Upper portion of leaf.
B. Lower portion of leaf.
C. Raceme bearing two fruit.
D. Transverse section of fruit showing upper half with seed in position.
E. The other half showing dissepiments.
F. Showing the half seed from E.

Hab.: Near Kamerunga, *Howard Newport.* This tree does not seem to have been previously met with in Australia. The typical plant is Vitian, but, Dr. Seemann's diagnosis of the species being very brief, our plant may prove, when both are better known, an Australian form of the species. I take the present opportunity of giving the following notice of a Lizard Island species of this genus, which, so far, seems only known from specimens collected by Banks and Solander during Captain Cook's voyage in 1770.

B. calyptrata, *R. Br.* Benth. in Fl. Austr. III., 288. (Referring to the extinguisher-shaped calyx.) A large, glabrous tree; branches terete, somewhat thick, bearing numerous prominent marks, showing where fallen leaves had been attached. Leaves numerous at the ends of the branches, the lower ones nearly sessile, upper ones petiolate, elliptic, somewhat obtuse, quite entire, glossy, flat, thin, about 9 in. long, deciduous, lateral nerves somewhat distant; petioles flat or convex, scarcely ½ in. long. Inflorescence lateral spicate, solitary, subpenduous, long as the leaves. Rhachis angular. Calyx bearing a thin grey tomentum, lobes forming a hemispherical, membranous, deciduous operculum, tube cyathiform, margins entire. Petals 5, ovate, obtuse, concave, erecto-patent, white, about ½ inch long, caducous. Filaments numerous, filiform, white, about 1 inch long, very caducous, all connate at the base. Anthers ovate, yellow. Style filiform, green, rather longer than the stamens; stigma truncate. Fruit oblong, glabrous, enlarged at the centre, attenuated at each end, about 3½ in. long. Cells, 4. From Britten, Ill. Bot., Cook's Voy.

Hab.: Lizard Islands.

Order FUNGI.

CERCOSPORA, Fries.

C. Apii, *Fries.* Sacc. Syll. Fung. IV., 442. Spots amphigenous subcircular, pale-brown, 4 to 6 mm. diameter., more or less definite, narrow margins sub-elevated; hyphæ mostly hypophyllus, in little brown tufts, gregarious, continuous or 1 to 2-septate, subundulate, 40 to 60 by 4 to 5 μ. Conidia thin subclavate, 3 to 10-septate, 50 to 80 by 4 μ subhyaline. Identified by Mr. G. Masse, of Kew, England.

Hab.: On umbelliferous plants in Europe and N. America. The past season destructive to celery in some Brisbane gardens.

CHINA CLAY.

ANOTHER PAYABLE INDUSTRY FOR QUEENSLAND.

Two samples of china clay, collected from deposits near Brisbane, were forwarded to the Imperial Institute by the Agent-General for Queensland, in order that they might be examined and their commercial value ascertained.

Description of Samples.

Sample No. 1.—This weighed about 4 lb., and consisted of a soft, white powder, quite free from grittiness.

Sample No. 2.—This specimen weighed about 4 lb., and consisted of a soft, faintly buff-coloured powder. When rubbed between the fingers it was found to be slightly gritty.

Chemical Examination.

The composition of the samples was found to be as follows:—

		Sample No. 1. Per cent.	Sample No. 2. Per cent.
Alumina	Al_2O_3 ...	28·54 ...	29·57
Ferrous oxide ...	FeO ...	0·58 ...	1·03
Ferric oxide ...	Fe_2O_3 ...	0·81 ...	0·87
Lime	CaO ...	0·45 ...	0·35
Magnesia	MgO ...	0·68 ...	0·46
Soda	NaO ...	0·41 ...	0·58
Potash	K_2O ...	1·77 ...	0·91
Silica	SiO_2 ...	58·42 ...	54·90
Moisture and combined water	...	8·30 ...	11·44

Technical Trial.

Sample No. 1.—When mixed with water, this forms a "body" possessing good plasticity, and which is readily shaped, and on firing yields a "biscuit" free from cracks and almost white.

Sample No. 2.—The "body" prepared from this clay is buff-coloured and somewhat gritty, but is sufficiently plastic to be shaped by "throwing." When baked, the slight buff colour of the clay disappears, leaving a "biscuit" of an almost pure white colour. The "biscuit" shows no signs of cracks, but is somewhat rough, owing to the presence of the gritty material already referred to.

The foregoing results show that although these clays contain rather more silica than is desirable in china clay, yet their plasticity, colour, and firing qualities are quite satisfactory, and would enable them to be used for the manufacture of pottery.

Neither of these clays, in their present condition, is suitable for use for the purposes to which the best kaolins are applied. The clays could be improved by careful elutriation, but their physical properties could be made equal to that of commercial kaolin of average quality by "grinding" and "pugging."—"Bulletin of the Imperial Institute."

The Horse.

DRIVING TEAMS AT SHOWS.

The "Concours d'attelages," or classes for driving horse and ox teams, lately held at Trilport, in the Seine-et-Marne Department, proved such a success as to suggest the idea that a similar one might be a considerable attraction at our Royal and other large shows. The thorough success of the Whit Monday show in Regent's Park is a further proof of the same. The object is not only an exhibition of driving skill, but to show that the animals can be driven equally well without whip or goad, and, therefore, tends to prevent unnecessary cruelty to animals. With the above may be joined prizes for condition of animals and harness, as well as rewards for long and faithful service. The chief difficulties are the space required and the fear of cutting up the ground should wet weather ensue. Still, vacant space can generally be found for the few hours during which the teams would be present, and one of the show rings might be used on the people's day, when the judging is over, before the parade of prize animals, and a great addition would be made to the interest of both town and country visitors. An opportunity would also be afforded for the practical testing of new inventions as regards carts, vans, harness, collars, humane tugs, and many other things. At Trilport there were twenty competitors—namely, nine in the class for teams of three horses, seven entries for pairs of horses, and four for yokes of four oxen.

The test consisted of driving the teams and vehicles over a course rendered so difficult with obstacles as to thoroughly prove the skill of the drivers. The carts and wagons were heavily laden with oats in proportion to the capacity of the teams.

The track, consisting of curves of varying sharpness, was over a stubble field and about 8 feet in width, and besides the course the vehicles had to be backed twice—a difficult task, impossible to a "shiverer." The track was edged with small billets of wood set up like ninepins, so as to fall at the slightest touch, and the driver gained the prize who knocked over the fewest, as in our driving competitions. The most successful upset only one. As might be expected, the yokes of oxen, though slow, were not so sure as the horses and less amenable to guidance, in spite of the obvious skill and attention of their drivers.

At noon, when the trials were completed, the distribution of the prizes to the successful competitors took place.

La Société Protectrice des Animaux, which corresponds to our own Society for the Prevention of Cruelty to Animals, gave medals and certificates of honour to the farm labourers whose animals showed signs of having been the best treated, trained, and handled. Here, of course, all deserving of encouragement might well be rewarded. One pleasing incident was the large number of well-known farmers and agriculturists who honoured the show with their presence, and took a deep interest in the proceedings.

Yet another novelty which might with advantage be added to our shows was a short but impressive address given after the prizes were distributed by Mr. Benard, urging employers not to look upon their men as mere "hands," but hearts and intelligent auxiliaries in the work, and to interest them financially and of good will in the success of their labour of whatever description it might be. As he well put it, "Good masters make good workmen," and we may add that the converse or reciprocity also applies to the labourers. In fact, this first show of teams proved in every respect a complete success, besides the interest afforded to the spectators, which may be attributed to the excellent organisation which the Agricultural Society of Meaux brings to bear upon all its enterprises, and which shows the indisputable usefulness of this institution.

We commend the above idea, which is taken from the "Live Stock Journal," to show committees generally in this State. Such competitions would certainly prove highly attractive, and could be arranged on many show grounds, especially in the country, without much trouble or expense.

Tropical Industries.

CHILLIES OR CAPSICUMS.

In the "West Indian Bulletin," No. 3, Vol. VII., will be found a most instructive article on the Capsicum genus of the natural order Solonaceæ, by W. R. Buttenshaw, M.A., B.Sc.

We have several times drawn attention in this Journal to the facilities for establishing a trade in dried chillies which exist in this State. From Cape Byron to Cape York the chillie, in all its varieties, thrives luxuriantly, and bears heavily all the year round, yet nothing is done with them. In Madras alone there are 70,000 acres under chillie cultivation, and exports reach 10,000 cwt. per annum. In Bengal the *C. annuum* is extensively grown. In Zanzibar the cultivation of chillies is an industry of importance, the exports averaging about £8,000 per annum. The natives there take very little trouble in preparing the product for market, with the consequence that Zanzibar chillies have fetched the poorest prices—viz., only 30s. to 31s. per cwt.—of any on the market. If they would take the trouble to remove the stalks and dirt which accumulates by the fruit being allowed to drop and lie for days on the ground before being collected, it is probable that the price would be increased by 15s. at least per cwt.

Then, Zanzibar chillies, as they appear in the market in a dry state, are small, red, thin, carrot-shaped fruits, about an inch in length.

In Uganda the export of chillies is of the value of over £4,000 annually, and in British Central Africa the cultivation is being greatly extended, as the export has proved profitable.

In the West Indies a consignment of 64 lb. of yellow Nepaul peppers and 53 lb. of ordinary red chillies, forwarded to London by the Imperial Commissioner for Agriculture, realised very good prices.

The Nepaul peppers were sold at the high price of 51s. per cwt., and the red at 26s. The former price, however, it is fair to say, was obtained owing to its being a small lot, and to strong competition between two bidders who particularly wanted them. It would not be safe to figure on more than 30s. per cwt. for any quantity. A little lot from St. Kitts brought the exceptionally high price of 80s. per cwt., although the average price which might safely be relied on for a big consignment would only be about 40s. per cwt.

MARKET FOR CAPSICUMS.

In August last the Secretary of the West India Committee wrote to the Imperial Commissioner of Agriculture that, as one of the results of the Indian and Colonial Exhibition at the Crystal Palace, he had received inquiries as to whether capsicums could be shipped in bulk from the West Indies.

In his monthly report on the London drug and spice market for September, 1905 (*see* "Agricultural News," Vol. IV., p. 351), Mr. J. R. Jackson, A.L.S., made the following reference to trade in capsicums:—

"On the 6th, fine Nyassaland, 37s.; large Japan, 24s. per cwt. On the 13th, good, bright red East Coast of Africa, 33s. 6d. On the 20th, Mombasa chillies were bought in at from 28s. to 30s.; some fine, bright, small Mombasa capsicum chillies, without stalks, 62s.; fine red Japanese chillies, 34s. On the 27th, good bright Zanzibar and Mombasa, 28s. to 30s."

We have already dealt in this Journal with the cultivation of capsicums. The after treatment is described in the article under notice as follows:—

The pods will begin to ripen in about four months from planting, and the ripening will continue for some time. The plants should be gone through once a week, and all the fruits that are fully ripe gathered. They should not

be allowed to fall to the ground. Dry weather should, if possible, be chosen for picking. Any fruits having breaks or blemishes should be discarded, as they would decay before drying properly.

The next operation is the drying and curing of the fruits. This is probably the most important point, for whether the grower will get a good price for his product will depend upon the proper curing. If chillies are stored damp, they will soon be quite spoiled. Before storing, therefore, they should be spread out in the sun to dry. They must be handled carefully to avoid breaking the skin. As has already been mentioned, the Zanzibar product has fetched the lowest prices on account of its dirty condition. The chillies, having been dried on the bare ground, were dirty. It is also necessary that the fruits should be carefully stalked before shipment.

In reference to the matter of drying capsicums, it may be of interest to quote from the last annual report of the Agricultural Instructor for Nevis. Mr. Hollings says:—

"It is essential, in order to preserve their bright colour, that the peppers should not be picked till thoroughly ripe, and then dried as rapidly as possible. Drying is easily accomplished in the sun and wind in trays with fine wire-netting bottoms, so as to allow the air to circulate freely. These trays should fit into a rack one above the other, but with a good air space between them; the trays can then easily be put out in the sun, and, if rain threatens, run into their rack under cover instantly. Peppers lose roughly about 70 per cent. of their picked weight in drying (about 2 per cent. are stalks, which have to be removed before shipping, although they should always be picked with them on); some 6 to 8 per cent. will, with the most careful picking and drying, be slightly discoloured, and had better be rejected from shipment; they will be quite good for seed. The remaining 23 or 24 per cent. are fit for the market.

"Even such pungent things as peppers are not free from the attacks of worms. The resulting crop of this season was carefully selected and packed in barrels for shipment. When, after some unavoidable delay, the barrels were opened and again examined, they were found to be badly attacked by these worms, and the envelope or skin nearly destroyed."

In regard to the yield of capsicums, the Californian writer referred to above states that 1,250 lb. per acre is considered to be a paying crop, but that, under specially favourable conditions, double that quantity may be obtained.

The yield of capsicums from the $\frac{1}{10}$-acre plot at the Nevis Experiment Station was 365 lb. from the first picking, and 183 lb. from the second, or a total of 548 lb.

An acre will be tried this year on at least two estates in Nevis to test the commercial value of capsicums on an estate scale.

CIGAR LEAF IN NORTH QUEENSLAND.

By R. S. NEVILL, in the "Australian Tobacco Journal."

Treatment of Seed Beds.

After sowing, the beds should be covered. Butter cloth or calico is best; but, in the absence of these, grass can be used. This covering is necessary, as the hot sun will kill the plants as they sprout, or "in the crook," as the Yankees say.

As the plants begin to grow, they should be gradually hardened by removing the covering each day for a while, making the time longer each day until they are left entirely uncovered for a week before transplanting. If the weather is dry, the beds should be watered at least every other day, late in the afternoon, until the plants come up, which may be a week or it may be two weeks, owing to the season.

If the sun is very hot, a good covering of grass laid flat on the ground is the better plan until the plants are up; and, as they begin to grow, this covering should be thinned, but the grass covering need not be removed when the plants are watered.

After the plants are well up, water as they need it, but not too much, or they will grow up thin and sappy, and will not stand transplanting so well. Before sowing the seed, it is a good plan to sow about ⅛-inch of sand over the bed. This prevents the ground cementing so badly when the plants are being watered. When they have developed four to six leaves, care should be taken not to water too much, or "blue mould" may develop on the plants. They should only have enough water to keep them healthy. A slow-growing plant in the bed, if healthy, is usually hardy. Thin out the plants if they are too thick in the bed; also pull up any weeds that may appear in the beds, but if the beds are well burned you will not be troubled with them.

TRANSPLANTING.

This should be done late in the afternoon. The rows should be 3 feet 6 inches apart, and the plants placed 18 to 22 inches apart in the rows. Select strong healthy plants with good lengthy stocks, and set them well down in the earth, pressing the dirt well to the roots. By having long stocks and setting the plant deep, the roots rest in the moist earth and will thrive better. In drawing the plants from the seed beds, it is best to take a three-tined steel table fork and raise the plant with it. This leaves a good bunch of earth clinging to the roots, and enables the plant to take root better. Transplanting should be done after rain, or in cloudy weather, as much as possible; but if the weather be dry, water should be used to set the earth about the plant, and early next morning a light covering of grass should be put over each plant before the sun is up. If the weather continues dry for some days, it will be necessary to water the plants occasionally until they take root. This can be done by using a bucket of water and a cup. Pour about a pint over each plant. This should be done about sundown; it is not necessary to remove the grass covering when watering.

In setting the plant, scoop out with the hand some of the earth so as to make a depression around the plant. This serves to keep the water from running away from the plant, and also, when the grass covering is laid over it, it will not press it down. The depression should be made deep enough to leave the plant standing erect when the covering is put over it.

CULTIVATION.

Clean cultivation is necessary. After the plants have taken root, the field should be gone over with a hoe, the earth loosened about the plants, and the weeds chopped out. When the plants are 3 or 4 inches high, a Planet Junior with the small points should be run between the rows. The Planet Junior should be well opened out, and run as close to the plant as possible without cutting it up; and it should be run to its full depth to form a loose root bed, that the roots may run and not be dwarfed.

This ploughing should be done every ten days, but not run so close to the plant nor ploughed deeply until the plants are 12 or 15 inches high. Then a pony turning-plough with one horse should be used for hilling up. When this is being done, the plough should not run closer to the plant than a foot.

The tobacco should be kept free from grubs. The time to look for these is early in the morning. Later on come the topping and priming, which should be done promptly when the time arrives. Topping is pinching out the seed bud, and priming is breaking off three or four bottom leaves to let the air

circulate under the plant. Topping and priming should be done at the same time; and, after this is done, there should still remain on the plant eighteen or twenty leaves.

Do not let your plants flower, except such as you want for seed. After topping, suckers will shoot up from the base of the plant and where each leaf joins the stalk. These should be kept broken off, and not allowed to grow to any size. Suckers will have to be taken off two or three times before the crop ripens.

HARVESTING.

Tobacco should not be cut until fully ripe, but it should not be allowed to get over-ripe. It is ripe when the leaf begins to droop, and shows a rough surface and brown spots appearing on it. In the early morning, if the ripe leaf is folded, it will split along the fold. Cutting should not be done in the heat of the day, if the weather is hot.

The stalk should be split to within 6 or 8 inches of the ground, and then cut off at the ground, gently laid down with the butt towards the sun. Let it lie until it is thoroughly wilted, which will take from thirty minutes to an hour, according to the weather. After it has wilted, hang it astride a stick. Other methods of harvesting are practised, such as spearing the stalk, also gathering the leaves and stringing them; but the above is the simplest to beginners. In hanging on the stick, each plant should occupy a space of at least 6 inches to prevent crowding—that is, fully 6 inches between the plants.

For convenience, a scaffold can be erected on the field, and the sticks of tobacco hung on it for two or three days until thoroughly wilted; but it is better to take it to the shed if convenient to do so, and hang it on the lower tiers; but, if a scaffold is necessary, it should be made under the shade of a tree, so that the hot sun will not shine on it. Care should be taken that no rain falls on it after it is cut. Tobacco should never be cut when wet from either dew or rain, and after a good rain should not be cut for three or four days, unless it is already fully ripe.

When taken to the shed, the sticks must not be hung too close together, but so placed that the tobacco on one stick barely touches the tobacco on another. It should be opened out well on the sticks. If this care is not taken, it may house-burn and stem-rot, either of which mishap destroys its value.

After hanging in the shed, give plenty of ventilation for the first two or three weeks, but protection from hard winds must be afforded. After this time so much ventilation is not needed, but it is not advisable to have the shed too close.

In curing tobacco, the conditions should be as uniform as possible, or any changes should be very gradual.

Fire should not be used in curing cigar tobacco, except when the weather continues wet and it is likely to be damaged, and then only for an hour or two at a time; then stoves should be used for drying-out the shed, but the pipes should run outside and no smoke allowed to get on to the tobacco; or charcoal pans may be set on the floor after the smoke has burned off.

The cigar-leaf industry is a valuable one, and, if once developed in this State, will be found to be exceedingly valuable to the small grower, especially to those farmers who are at some distance from shipping points and have to haul their produce considerable distances. To such farmers I especially commend the crop; at the same time it is a profitable crop to all farmers where a high-grade leaf can be produced, and I feel satisfied that a high-grade leaf can be produced in the districts I have mentioned; and it is sincerely to be hoped that the effort will be made by some of the farmers in these districts with the view of growing it commercially as a regular crop, and not as a curious experiment.

QUEENSLAND SUGAR PLANTING.

A NEW CANE-CUTTING MACHINE.

The "Coloniser," an old-established British journal devoted to colonial interests, thus discourses on the Queensland sugar industry:—

Under the present temporary bonus system the sugar industry of Queensland is showing surprising growth. There are now, in fact, 116,000 acres cultivated by white men alone, as against 37,000 acres by kanakas. In the past four years the number of white farmers has more than doubled, in fact; and, while the 20,000 whites produce 112,000 tons of sugar more than was produced by white labour four years previously, coloured labour (8,000 hands) produces 12,000 tons less.

As there should be no limit to the prospective increase in this amount by white labour, if economically possible, to decrease the present working costs by introducing improved machinery is the natural solution of the question. This, Mr. Silverwood, a well-known Anglo-Australian, claims to have done, and in the course of a call we recently had from him he showed us detailed plans of a light, simple, and practical machine for cutting the canes close down by the roots, which he estimates will reduce the cost of cutting by £1 per acre. As the machine only weighs about 60 lb. and can be made for £30 to £40, it appears to us specially adapted for the wants of the white small cultivator at present in evidence in Queensland, and also to the large plantations where such exist. It should also be of use in other parts of the world, though designed primarily to meet the urgent needs of the Queensland industry.

Mr. Silverwood also claims that thousands of tons of cane, and the better part of it, too, will also be saved by the use of the machine, in being able to cut nearer to the ground, where the greater part of the juice is concentrated in the cane; also the terrible strain of many hours of stooping to the cane-cutter, by manual labour, will be entirely obviated by the mechanical machine. Years ago the machine was exemplified before the Royal Commission that was then proceeding through the sugar districts of Queensland, and practically proved in its model form, before the commissioners and prominent planters, the capabilities of its utility. But, as one gentleman remarked in confidence to the inventor, "Don't lose heart, but at present, with unlimited cheap labour available, you are twenty years before your time; but eventually your fortune will be made." In some respects the words were prophetic, as far as time has gone. The other, the inventor hopes, will be so!

"Some idea," stated the inventor to us, in conclusion, "of the saving to the planters may be conveyed when I say that by the mechanical cutter 9 inches to 12 inches of cane, and that of the very best part, will be added to their crop of cut cane, running into hundreds of tons weight from many districts, and I am quite justified in saying that the cane will be cut at least three to four times as quick by the machine as could be done by the cane knife. One man wields one knife, cutting one piece at each individual blow, that is providing the cane is about one season's growth; but some cane that I have seen would be from 2 inches to 2½ inches in diameter, when the cutting becomes exceedingly difficult to get through. One man manipulates each of my machines, and can cut through a stole of cane whilst the black boy would sometimes be hacking at one stalk, and it will and must be eventually proved that the cane-cutting machine, like the sheep-shearer machine, will revolutionise the whole industry in its particular way."

In view of the vital importance to the Queensland sugar industry of this question of reduction of working costs, no doubt the foregoing statements will be read with interested attention in such quarters, and on receipt of any letters for the inventor, sent care of "The Coloniser," we shall be happy to forward them on to him.

RAMIE.

THE DECORTICATION OF RAMIE.

By H. R. CARTER, Textile Engineer.

The fibre is removed from the stem of the plant by decortication, which should be practised upon the stems when in a green state, because when they are dry the outside skin becomes hard and brown, and most difficult to remove. In China, whence comes the best cleaned fibre, decortication is a manual process practised by women and children, and is a long and costly operation, since a woman can produce only a few pounds of fibre per day. This she does by placing a few green stems upon a flat board and scraping them with a piece of wood, in order to remove the woody matter with as much of the gum as possible. From 20 to 30 per cent. of gum still remains in the best-cleaned fibre.

Many decorticating machines have been patented, but most of them have been found defective. What is required is a portable machine, which may be dragged over the estate and worked by native labour or by a portable or locomotive engine. It should do the work quickly, and as well as can be done by hand, without breaking or "slaving" the fibre. The machine should, furthermore, be capable of stripping the leaves from the stems at the same time, since, if this work has first to be done by hand, it adds considerably to the cost of production. The best machines will decorticate about 2 cwt. of green stems per hour, and produce from 2 to 4 per cent. of scraped ribbons.

In order to aid the decorticating machine to do its work effectively and quickly, the green stems should first be crushed by a passage through a breaking machine, consisting of one or more pairs of heavily weighted plain or fluted rollers.

In one of the most effective decorticating machines upon the market the crushed stems are cleaned by a passage between a pair of pallet drums, so arranged that the pallets of one drum intermesh with those of the opposite drum. The stems are clamped and held in a holder, which moves forward upon the feed sheet, so that the points are first presented to the scraping action of the drums. When rather more than half the length of the stem has been cleaned, the motion is reversed, the stems withdrawn, and the other end, which has been held in the clamp, subjected to the action of the cleaning drums.

In another well-known machine the stems are fed inwards, and point forwards in a similar manner, and are divested of their fleshy substance by the knives of rotary scutchers on adjustable contact pieces, which offer but one line of contact to the knives. The drawing back again of the stems removes all adherent matter.

In another well-known machine the stems are held by a pair of intersecting ropes or bands, which carry them forward into the machine, where the ends are subjected to the action of rotary and intersecting scutching blades. When half-way through the machine, the stems are ingeniously transferred to a second pair of intersecting carrying bands, which grip them in a different place, and thus allow that portion of the stem which has escaped the action of the cleaning blades to be thoroughly scraped before the ribbons of clean fibre finally issue from the machine.

It is reported that attempts are being made to interest the United States Government in the ramie industry, and, according to the "Home and Colonial Mail," some capitalists are proposing to make Washington a manufacturing centre for a new industry. A correspondent of the New York "Journal of Commerce" says that Mr. S. H. Slaught, who has made various attempts to interest the United States Government in ramie, announces that he has discovered the secret of degumming ramie without injuring the fibre. He has approached a number of influential capitalists, and everybody has held back, waiting for the Government to appropriate money for an initial demonstration. The promise has been given by a number of senators and representatives that

such a Bill would be passed at the next session of Congress. But, in the meantime, some of the railroads have taken up the matter, in the belief that it would form an important crop for their lines to handle. It is said that "a good stand" will produce two crops a year, and yield from 2,000 lb. to 3,000 lb. of the dried and baled fibre to the acre each season. Some of the Washington traders are said to be interested in the matter.—"Tropical Life."

NEW WAX PRODUCT.

It is reported that a product has recently been discovered in the leaves of the rafia palm which, by its chemical and physical properties, might be classed between wax and gum, and bids fair to become a valuable commercial commodity of Madagascar. The process of extracting the wax is simple. The natives who gather the rafia fibre generally pitch their camp in the neighbourhood of a rafia grove, to which they bring the leaves. The fibre is taken off and the leaves are thrown aside in large quantities. The wax is collected by beating the dry leaves on a dry mat or cloth, and gathering the pellicles and white powder which fall from them. Then, after boiling these pellicles and powder, the wax thus formed is kneaded into cakes of any form. This wax, which is very pure, will probably be more highly valued than beeswax, although yet an entirely new product. It first made its appearance in the market place at Marovoay in October of last year. The curiosity of the merchants of Majunga being roused, they bought the whole lot at 2s. 1d. per lb. and shipped it to France in order to ascertain its industrial and commercial value. When the Governor-General of Madagascar heard of the discovery, he ordered a sample of 25 lb. to be forwarded to Doctor Heckel, Director of the Colonial Institute at Marseilles, who will make an analysis. Doctor Lacaze, Mayor of Majunga, furnishes the following information with regard to what a rafia leaf will produce in fibre and wax, the chief products of this palm. The following are the quantities obtained by experimenting on 10 rafia stalks of $3\frac{1}{2}$ to $4\frac{1}{2}$ yards long, ordinary dimensions, for some leaves attain 7 and 8 yards (the weight kilo. being 2·2 lb.):—

	Kilos.
Total weight of 10 leaves	104·500
Weight of green fibre skinned from 10 leaves ...	9·200
Weight of same when dry and ready for sale ...	4·660
Weight of refuse (cane ribs excepted) green ...	32·550
Weight of same dried	11·000
Weight of powder unprepared	·810
After manipulation, weight of waxy substance from 10 leaves	·780

Hence it appears that rafia can yield in wax theoretically some 16 per cent. of the prepared fibre, but the experience of a laboratory would not be the criterion of production in actual practice. The natives allow the leaves to remain on the ground to dry, entailing a loss according to the inclemency of the weather or want of care. Then, at the moment when the leaves are shaken or rubbed in order to remove the wax, this excessively fine, light powder remains suspended in the atmosphere, and it is impossible to collect it all with only a cotton sheet to work with. In any case, however, it can be said that the average production of wax would be about 100 grammes for every kilo. of fibre obtained. The labour of gathering the leaves can be reckoned a negligible quantity, as the wax is not the primary product taken from the tree, but a refuse product obtained from the leaves already cut down for the preparation of rafia fibre. Supposing that rafia wax turns out to have a value about equal to beeswax; this means a yield of wax equal to three-fifths of the value of the rafia exported—certainly a very valuable new resource of produce, which the natives

are likely to take to. In fact, the process implies no great difficult innovation, being merely the utilisation of the refuse of an already well-established and remunerative industry. Nothing is yet decided as to what may be the possible use to which this wax can be put. It might possibly be utilised in the manufacture of bottling wax. Its consistency has led some to think it might be used for gramophone cylinders. In any case, several commercial houses have sent home samples to their firms, and probably in a short time reliable information as to its market value will be available.—"Chamber of Commerce Journal."

FIBRE PLANTS AS FOOD FOR STOCK.

An impression prevails that cattle will not eat agave plants if allowed to graze amongst them. That this is erroneous has been proved several times by sisal planters in this State. In India experiments have been made with a variety of agave called the *Agave lurida* (blue agave) as a famine fodder; and in a late report on the Agricultural Station at Orai, in the Provinces of Agra and Oude, the following is found:—

The question of fodder in times of famine becomes so acute that people are reduced to giving cattle almost anything, from old roof thatch to prickly pear, after scorching off the spines. What is really wanted to meet such conditions is a perennial plant which will grow and increase in ordinary years on waste land without trouble, and form a provision requiring only to be cut in a year of fodder famine. Unfortunately, no such plant seems to be known, except such rather unpalatable things as prickly pear. Some years ago *Agave cantula* was fed as a trial to cattle in Bombay, but the result showed without any doubt that it was hopeless. In spite of this, the great need to find something induced me to make a trial with *Agave lurida* (the large-leaved variety) with somewhat better results.

There being no blue agave near the Orai Experimental Station, the experiment was carried out at Cawnpore, except in the case of the trial with cultivator's cattle when the leaves were shipped to Orai. It may be objected that the method entails a great deal of trouble, but, compared with having to "chhíl" grass from early morning to evening, when there is hardly a blade to be seen, and collecting leaves and such like, the objection, provided the plants are not far removed, becomes insignificant. Objection to the question of fuel necessary for boiling may also be raised. But, as a matter of fact, all that is necessary for this purpose can be obtained from the tips and peelings of the leaves when dry, and some dung. It is not supposed for a moment that it will meet the need for fodder alone, as, if pushed too far, it produces diarrhœa (indicated in the trial at Cawnpore, when 80 lb. were fed and eaten without other food by one pair of cattle in a day). Yet, as an adjunct to other fodder, and to enable this to last out in hard times, it may not prove altogether impossible, provided it can be grown sufficiently near not to add distance to the trouble of preparation. But waste places are not near everybody, and certain soils may not suit its growth. There appears to be some difference as to the attitude of cattle with regard to it, some appearing to eat it readily when merely boiled and mixed with other fodder, others requiring it to be flavoured in some way. The trials at Cawnpore were made with well-fed animals. Two pairs of oxen were selected—one pair was fed from the 15th of January to the 31st of January; the other pair from 1st February to 20th March, when, after a break of twenty days, owing to pressure of other work, the experiment was continued from 13th to 19th April. One animal was weighed before and after feeding for a week. No change in weight was observed. It was, however, said that after feeding for some time, when put to work, the cattle appeared to have become less active. In considering the experiment it must be remembered that it is carried out to meet a condition

in which cattle eat almost anything to keep alive. But, before undertaking to recommend it as a poor adjunct to other food, it requires a prolonged test, for in dealing with a plant of this nature there is always a danger of some injurious results arising from its long-continued use.

CITRONELLA GRASS AND OIL.

In a very interesting report on plantation industries in the Federated Malay States and Java, the Hon. Staniforth Smith, of the Australian Parliament, makes the following reference to the cultivation of citronella grass:—

From citronella grass (*Andropogon nardus*) a valuable scented oil is obtained that is used in the manufacture of superior soaps and other articles. In Java there are several large plantations—one of those I inspected being nearly 1,000 acres in extent.

The grass, if planted in good fertile soil, and enjoying a heavy rainfall, grows very quickly. From 10 acres a yield of 12 tons should be cut, and four crops a year can be taken off, totalling 48 tons. This will yield about $\frac{1}{2}$ per cent. of oil, or $4\frac{4}{5}$ cwt., worth 3s. 10d. a kilogramme, say £46 16s. The grass lasts twelve years before it is necessary to plant again. To obtain the oil from the grass by distillation a small plant is required, consisting of one boiler costing £250, and a tank and condenser with pipe connection costing £85. A round tank, 16 feet in diameter, would be sufficiently large to treat four crops a year off 200 acres, if worked day and night.

While I would not recommend this as a principal crop in Papua, I think it should be cultivated, as in Java, as a catch crop between the rubber or cocoa-nut trees. The profits from this crop would be sufficient to pay the cost of maintaining a young rubber or cocoa-nut plantation until the trees began to bear.

PREPARATION OF SANSEVIERIA FIBRE.

There is at present, says the "Bulletin of the Imperial Institute," great uncertainty with regard to the botanical identity of the various species of Sansevieria, owing to the lack of authentic material (including flowers) on which to base determinations. For the present, therefore, it will be the best plan to distinguish provisionally the three plants yielding the fibres described as *Sansevieria Volkensii*, *S. guineensis*, and *S. Ehrenbergii*.

There is no doubt that all these fibres are of a character which renders them of great utility for rope manufacture and capable of securing a ready market.

The following points must be observed if the fibres are to realise good prices:—(1) It is essential that the product should be cleaned as thoroughly as possible. After leaving the machine, it is desirable that the material should immediately be washed in order to remove the juice of the leaf, which, if allowed to dry on the fibre, is liable to stain and weaken it. (2) After being dried, the product should be brushed by means of one of the machines specially designed for this purpose, so that the fragments of dry pulp adhering to the fibre may be removed. (3) It is advisable that the fibre should be roughly graded, according to length, before export, since the presence of short fibre in a consignment which is mostly of good length (4 feet or more) considerably lessens its value.

The faulty preparation of this valuable fibre has been the cause of the low prices it has been valued at by British experts. These values have ranged from £22 to £29 per ton.

NORTH QUEENSLAND AS A MARKET FOR FRUITS FROM THE SOUTHERN STATES.

The following letter has been addressed to the editor of the "Fruit World," Melbourne:—

As a distributing centre, Townsville has a wide stretch of hinterland, the railway extending past the important mining centres of Charters Towers and Ravenswood—both good outlets for fruit; some 230 miles to Hughenden; thence 90 miles to Winton in one direction, the heart of the pastoral industry, and on the other side to Richmond. From here are at present another 200 miles of railway being constructed to tap the great copper fields of Cloncurry—a line sure to provide a large outlet for all kinds of produce. In the port of Townsville, steamers run alongside the railway, so that unnecessary handling is avoided; only one great desideratum in this torrid climate—refrigerated trucks—the railway does not yet provide. The railway service is excellent, trains running every other day to the head of the line, and three times daily to Charters Towers. The communication with the South is kept open by three lines of steamers running through from Melbourne to here, without transhipping cargo; one of them, the Adelaide Company, providing cool storage, which should prove an important factor in the transportation of perishable fruits, such as Victorian pears and eating plums, much in demand here. With the North we have almost daily communication, chiefly by small river steamers engaged in the banana trade acting as feeders to the trunk lines. It must be admitted that, as a distributing centre, Townsville offers every facility.

On the other hand, as a producing centre, Townsville is nowhere; there is very little arable soil in the immediate vicinity, and what there is is taken up chiefly by Chinese market gardeners—a hard-toiling race, which will be realised if I state that we have practically no rainfall from August to October, yet they manage to raise, by means of irrigation and much laborious carrying of water, fine crops of potatoes, tomatoes, and cucumbers—these three lines being largely exported to Sydney and Melbourne—besides the usual run of kitchen stuff. Even cauliflowers and asparagus are grown, although not comparing with the produce of colder climes. The main advantage in this is the fact that it all comes so early in the year that southern markets are bare and ready to absorb the surplus. However, excepting the mango, fruit is not produced. We are now (end of November) in the midst of the season; the crop is so heavy that it is impossible to find an outlet for it all, and the flying foxes are having a feast. The mango is a fine evergreen shade tree, attaining the dimensions of a large forest tree, and being besides a heavy bearer; it is planted in every suburban garden, even forming avenues leading up to the houses. The fruit does not come true to seed, and there are, in consequence, innumerable varieties, ranging from the size of an apricot to that of the largest apple, and from the colouring of a peach to that of a cucumber, and farmers detect any kind of flavour they please in them. The fruit hangs on long slender stems on the utmost periphery of the tree, almost impossible to get with a ladder; it is, therefore, raked off the tree with a long bamboo rod and hook, and allowed to drop into a net staked into the ground. The only other commercial fruit crop here is grapes, grown some distance from town, on the slopes of Mount Elliott. In connection with this, the writer remembers returning the owner of half an acre of muscatels £150 clear of all charges for his crop. Possibly a record. Grapes come into the market end of November and lasting right through to end of May. Results as the above could only be obtained in a very dry year and with the help of irrigation, and is more the result of high prices than of quality. Townsville itself lies within a dry belt, while the sugar and banana lands, stretching along the coast from 80 miles northwards, enjoy an abundant rainfall. How abundant this rainfall is may be

best illustrated by a little anecdote. We remonstrated with an orange-grower on one of the northern rivers (who, by the way, produces some of the finest fruit in Australia, great balls of juice, with a skin as fine as paper) for packing his fruit directly after heavy rain, and his reply was characteristic of the conditions under which he laboured. He said: "I wish you would send me dry weather; it is now April, and since last October it has been raining every day." We have a few dry hours about midday, and that is the time we pull and pack. Of course, the result is that fruit carries barely the 24 hours steam to here. The vicinity of high mountain chains close to the seaboard, precipitating the moisture in the monsoonal winds, accounts for this abnormal state of things. As to the disposal of the fruit when it reaches here, it comes to selling agents, who parcel it out to retail shops. A very little locally-grown is sold by auction. Apples, pears (not cooking), lemons, plums, peaches, &c., sell well; but the demand for oranges and mandarins is entirely covered by the production within a few hundred miles north and south of this port. There is, in fact, an appreciable surplus for exportation.

Times of Sunrise and Sunset, 1907.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·56	6·45	5·20	6·42	5·40	6·21	5·57	5·47
2	4·57	6·46	5·21	6·42	5·41	6·20	5·58	5·46
3	4·58	6·46	5·22	6·41	5·42	6·19	5·58	5·45
4	4·58	6·46	5·23	6·41	5·42	6·18	5·59	5·44
5	4·59	6·47	5·24	6·40	5·43	6·17	5·59	5·43
6	5·0	6·47	5·24	6·39	5·43	6·16	6·0	5·42
7	5·1	6·47	5·25	6·39	5·44	6·14	6·0	5·40
8	5·1	6·47	5·26	6·38	5·44	6·13	6·1	5·39
9	5·2	6·47	5·26	6·38	5·45	6·12	6·1	5·38
10	5·3	6·47	5·27	6·37	5·46	6·11	6·2	5·37
11	5·3	6·47	5·28	6·36	5·46	6·10	6·2	5·36
12	5·4	6·47	5·29	6·35	5·47	6·9	6·3	5·35
13	5·5	6·47	5·29	6·35	5·47	6·8	6·3	5·34
14	5·6	6·47	5·30	6·34	5·48	6·7	6·4	5·33
15	5·7	6·47	5·31	6·33	5·48	6·6	6·4	5·32
16	5·7	6·47	5·32	6·32	5·49	6·5	6·5	5·31
17	5·8	6·47	5·32	6·31	5·50	6·4	6·5	5·30
18	5·9	6·47	5·33	6·31	5·50	6·3	6·6	5·29
19	5·10	6·47	5·34	6·30	5·51	6·1	6·7	5·28
20	5·11	6·47	5·34	6·29	5·51	6·0	6·7	5·27
21	5·11	6·46	5·35	6·28	5·52	5·59	6·8	5·26
22	5·12	6·46	5·36	6·27	5·52	5·58	6·8	5·25
23	5·13	6·46	5·36	6·26	5·53	5·57	6·9	5·24
24	5·14	6·45	5·37	6·25	5·53	5·56	6·9	5·23
25	5·15	6·45	5·38	6·24	5·54	5·55	6·10	5·22
26	5·15	6·45	5·38	6·23	5·54	5·54	6·10	5·21
27	5·16	6·44	5·39	6·23	5·55	5·53	6·11	5·20
28	5·17	6·44	5·40	6·22	5·55	5·51	6·11	5·19
29	5·18	6·44	...	...	5·56	5·50	6·12	5·19
30	5·19	6·43	...	...	5·56	5·49	6·12	5·18
31	5·20	6·43	...	...	5·57	5·48	...	...

PHASES OF THE MOON.

		H.	M.	
8 Jan.	☽ Last Quarter	0	47	a.m.
14 ,,	● New Moon	3	57	p.m.
21 ,,	☾ First Quarter	6	42	,,
29 ,,	○ Full Moon	11	45	,,
6 Feb.	☽ Last Quarter	10	52	a.m.
13 ,,	● New Moon	3	43	,,
20 ,,	☾ First Quarter	2	35	p.m.
28 ,,	○ Full Moon	4	23	,,
7 Mar.	☽ Last Quarter	6	42	p.m.
14 ,,	● New Moon	4	5	,,
22 ,,	☾ First Quarter	11	10	a.m.
30 ,,	○ Full Moon	5	44	,,
6 April	☽ Last Quarter	1	20	a.m.
13 ,,	● New Moon	5	6	,,
21 ,,	☾ First Quarter	6	38	,,
28 ,,	○ Full Moon	4	5	p.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

	ROCKHAMPTON.		TOWNSVILLE.		COOKTOWN.	
1907.	Rise.	Set.	Rise.	Set.	Rise.	Set.
January	18 m.	2 m.	42 m.	12 m.	53 m.	9 m.
February	15 m.	5 m.	36 m.	18 m.	44 m.	18 m.
March 1 to 20 ...	11 m.	9 m.	29 m.	25 m.	35 m.	27 m.
,, 21 to 31 ...	9 m.	11 m.	28 m.	26 m.	29 m.	33 m.
April	m.	13 m.	20 m.	34 m.	21 m.	41 m.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

SEVENTEENTH LESSON.

THE ANIMAL.—PRODUCTS OF ASSIMILATION: PROTEINS, FATS. PRODUCTS OF SECRETION AND EXCRETION: UREA, URIC ACID. LIQUIDS OF THE ANIMAL BODY: BLOOD, LYMPH, CHYME, MILK. EGGS. COMPOSITION OF THE HUMAN BODY.

Just like a plant, the body of an animal is built up of a very large number of organic compounds, some of which are of exceedingly complex chemical composition. The **elements** entering into the composition of an **animal body** are practically the same as those found in plants, differing, however, in their relative proportion; and certain elements, like chlorine, fluorine, and sodium, which are of little importance in vegetable life, are of greater moment to animal life.

We have already learned in previous lessons that a plant builds up its complicate structure of the carbon derived from the carbonic acid in the air; animal bodies are quite unable to do this, and depend entirely on the assimilation of **complex nutrients** obtained from the vegetable or animal food consumed. Some of the chemical compounds of the foodstuffs are directly utilised in the construction of the animal body, others are changed and transformed by the process of digestion, and others again go to waste by being excreted from the body in one form or another. The **animal tissue** itself undergoes continual changes, complex compounds breaking down into simpler ones, which are then excreted and made use of by the growing plant. *Nature thus works in complete circles;* the plants growing on the soil construct from a few simple compounds, as carbonic acid gas, nitric acid, water, and mineral salts, with the powerful aid of sunlight, the most intricate organic compounds, *storing a large amount of energy*, supplied by external force and **reduction** of carbonic acid, and liberating at the same time large amounts of oxygen, which in its turn is utilised by the animals. The animals require for the building up and for the continual reconstruction of their bodies organic compounds already existing as such in the foods consumed or derived by simple splitting up of such compounds; at the same time, some of these organic compounds will in turn be **oxidised,** and thereby the force or energy which was stored up in the plants will, by the vital processes of the animal body, be again *transformed into force and heat*, necessary to the performance of all internal and external work, and to the maintenance of the warmth of the animal body at a uniform temperature. The waste products of this oxidation or combustion are returned partly in form of manures to the soil, and partly in form of gases to the atmospheric air. These circles of changes are clearly shown in the diagram on page 140.

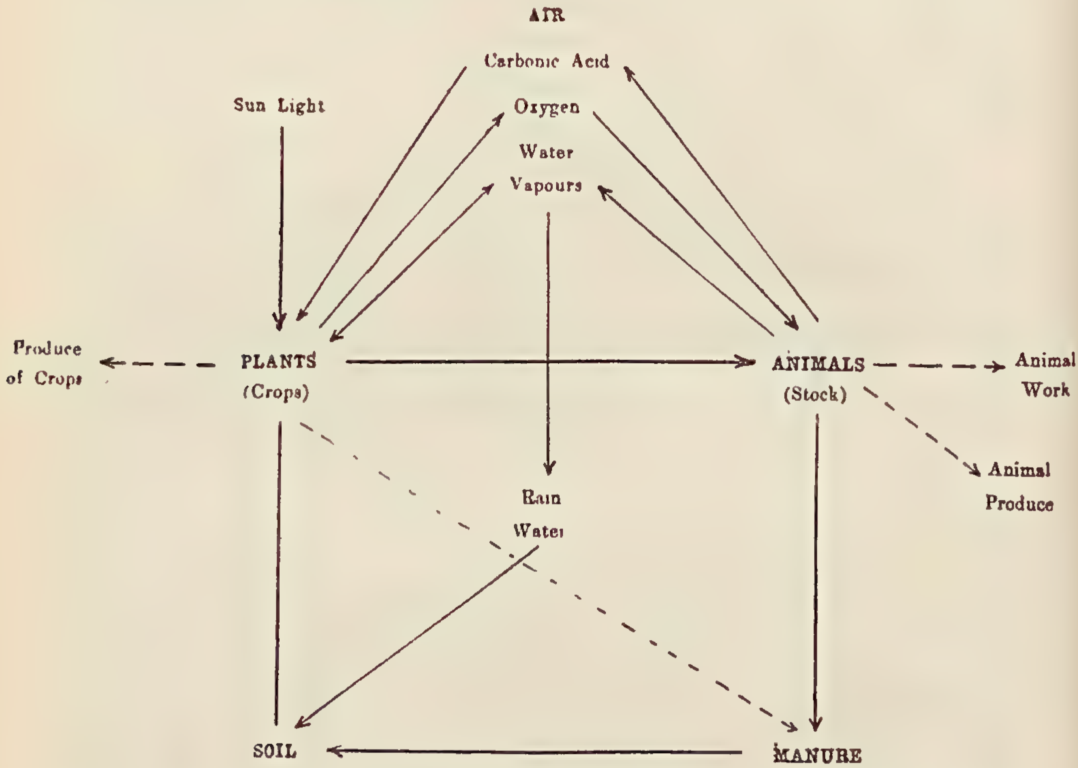
A strict line of separation between animal and plant life cannot be drawn, more particularly in reference to the lower forms of life, but the living substance of animals and plants appears to be practically the same, and is built up of colonies of minute cells.

In every living body we will always find *processes of building up* and rebuilding, as results of assimilation or **anabolism** going hand in hand with destructive *processes of decay* and excretion, **katabolism**; and based on this distinction we may divide the organic compounds of animal life into *products of assimilation* or *anabolism* and *products of katabolism.*

The most important compounds of assimilation necessary for the building up of animal tissue are the **proteins,** possessing practically the same characteristics as the vegetable proteins described in our last lesson. Some of these compounds are found in solution, others again as solids; and, as a rule, proteins are found in larger amounts in animal bodies than in plants. The most important animal proteins are—

Albumin, or *white of egg,* which is found as a slightly alkaline, colourless, viscid liquid, enclosed in minute transparent cells in the eggs of birds. Albumin coagulates when heated or when treated with certain acids or salt solutions. It is soluble in water, and the solution shows all the different properties of albumin (*Experiment 112*). Albumin is also found in the juice of flesh, in the blood (serum albumin), in milk, and also in urine as the effect of certain diseases.

Fibrinogen, or fibrin, is the peculiar protein of blood, separated out when blood is allowed to coagulate or *clot.* The dark-red jelly-like clot consists



chiefly of minute red and white blood corpuscles entangled in the coagulated fibrin. The clear yellowish liquid—*blood serum*—which at the same time is separated from the blood, has an alkaline reaction, and it contains a large amount of organic and inorganic compounds, amongst which is albumin, and this may be separated out by heating the serum (*Experiment 113*).

Myosin, or *muscle fibrin,* is the principal protein of the various nitrogenous compounds of muscle, found in amounts from 3 to 11 per cent. It is insoluble in pure water or in strong salt solutions, but soluble in dilute neutral saline solutions. It also coagulates when being heated.

Caseinogen, or **Casein,** is the principal protein of milk, found in amounts varying from 2 to 5 per cent. It is not coagulated by boiling the milk, but easily separated by the action of dilute acids, and also by the action of certain enzymes contained in *rennet.* Strong acids dissolve precipitated casein, and on this fact is founded the separation of butter fat from milk or cream in the

well-known Babcock test and similar tests. On the addition of strong sulphuric acid to the milk, a complete solution of the casein in the sulphuric acid takes place, the fat is liberated, and will rise to the top. This separation of the fat is facilitated by centrifugal force, by whirling the test bottles in suitable machines, and the percentage of fat is finally read off by the length of the column it forms in the graduated neck of the test-bottles (*Experiment 114*).

Gelatin.—Bones consist of earthy substances, chiefly calcium phosphate and nitrogenous organic matter (about one-third), chiefly **ossein.** This protein is insoluble in water, but by prolonged boiling is changed into a solution of *glue* or *gelatin. Isinglass* is a very pure form of gelatin, obtained from the air-bladder of certain fish (*Experiment 115*).

Other gelatin-yielding substances, like **elastin,** *collagen,* **cartilagin, or** *chondrin,* are found in all the materials forming the connective tissues of animal bodies, like tendons, cartilage, skin.

Keratin, another nitrogenous body containing much more sulphur (4 to 5 per cent.) than gelatin, is found as the principal constituent in hoofs, hair, nails, horn, feathers, and skin.

Chitin is a nitrogenous compound forming the horny covering of many insects.

The last few nitrogenous compounds are called by many chemists *albuminoids,* as forming a class of more insoluble and indigestible compounds of the class of proteins.

The proteins are transformed in the animal bodies by the process of digestion into more soluble and diffusible forms of **peptones** and **albumoses.** The enzyme *pepsin,* one of the characteristic constituents of gastric juice, and *trypsin,* one of the enzymes found in pancreatic juice, have a powerful solvent action on proteins, the latter more particularly on fibrin and elastin.

All the enzymes found in animal bodies and in plants are themselves produced from **proteins.**

Animal fats are salts of *glyceryl,* C_3H_5, the radicle of the alcohol *glycerol* or *glycerine,* $C_3H_5(OH)_3$, and fatty acids, more particularly *stearic, palmitic,* and *oleic acids.*

Well-known animal fats are lard, tallow, butter, train or whale oil, sperm oil, &c., which all differ in their melting point, in accordance with the predominance of one or the other of the fatty acids. In the solid fats **stearin** or *glyceryl stearate,* $C_3H_5(C_{18}H_{35}O_2)_3$, and in the liquid fats or oils the **olein** or *glyceryl oleate,* $C_3H_5(C_{18}H_{33}O_2)_3$, predominates.

Butter fat contains a large number of glyceryl salts, the most important of which are the salts of oleic, palmitic, myristic, lauric, butyric, and caproic acids.

Absolutely pure fats have neither taste nor smell, but exposed to the air, under the action of certain impurities, fats may become **rancid** by a process of hydrolisis and oxidation. Portions of the fats are split up into glycerine and free fatty acids, some of which are volatile, and cause the peculiar odour of rancidity. Part of the glycerol and fatty acids are further oxidised and decomposed.

Fats form a valuable reserve food of animals, and are deposited in the fatty tissues in cells, which are filled with fat in a semi-fluid state. The fats are produced from the fats contained as such in foods, and also from the carbohydrates, and even from proteins.

Products of katabolism.—During the physiological changes taking place in animal bodies, frequently *intermediate substances* of katabolism are formed, which may again be utilised in building up, or anabolism; such products are called **products of secretion.** Other products cannot be used again, and have to be thrown off in one form or another as products of excretion.

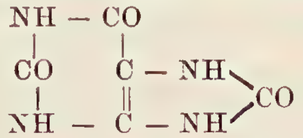
One of the most important products of secretion is the **bile,** a peculiar, yellowish, bitter liquid, discharged from the liver, and stored up in the gall-bladder. It contains a large number of organic compounds; some of the

principal ones are the *bile acids*—glycocholic acid, $C_{26}H_{43}NO_6$, and taurocholic acid, $C_{26}H_{45}NO_7S$—and their alkali salts, and **glycogen,** another reserve food of the general composition of carbohydrates, $C_6H_{10}O_5$, which is also found in muscles.

Other carbohydrates of sugars, like **glucose,** $C_6H_{12}O_6$, found in the blood serum and in muscles, and *milk sugar,* or **lactose,** $C_{12}H_{22}O_{11}.H_2O$, which is found in milk, are also products of secretion.

Products of excretion.—A great variety of compounds are found in that most important of all products of excretion—**urine,** in which all nitrogenous waste products, mineral salts, and water derived from foods and the breaking down of old tissues are removed from the animal body. The composition of urine varies considerably in accordance with the foods consumed, and, as a rule, the urine of herbiverous animals has an alkaline reaction, whereas the urine of carnivorous animals and of man is generally slightly acid. The most important nitrogenous compound of urine is **urea,** or *carbamide,* $CO(NH_2)_2$, which is found in larger amounts in the urine of carnivora than in that of herbivora, and is also found in traces in blood and perspiration.

Uric acid, $C_5H_4N_4O_3$ or



is particularly abundant in the excrements of birds and snakes; it is also found in the urine of carnivora, and also in traces in blood. The acid and its salts are only slightly soluble in water, and minute crystals of salts of uric acid are deposited in the bodies of people suffering from gout.

Hippuric acid, $C_6H_5.CO.NH.CH_2.COOH$, is found in the urine of cattle and horses, and in small amounts in human urine.

Nitrogen free acids, like formic acid, acetic acid, benzoic acid, butyric acid, and lactic acid, are frequently found in small amounts in the products of excretion.

In contrast with urine, the product of the kidneys, which only discharges digested waste products, there are the *solid excreta* of animals—**fæces**—which contain large amounts of undigested and of undigestible portions of food, besides various products of decomposition and excretion.

The liquid excretion—**perspiration**—exuded by the skin from the sweat glands, consists principally of water containing small amounts of saline substances, as common salt, urea, ammonia salts, and traces of cholesterine, formic acid, and butyric acid. This excretion acts as a check on the animal heat, the evaporation of the water helping to keep the body cool.

The excretion of the *lungs* consists chiefly of moisture and carbonic acid gas, derived from the oxidation of carbonaceous matter of the animal tissues. An adult man exhales daily from 6 to 8 oz. of carbon in form of carbonic acid gas, which requires about 1 lb. of starch, consumed as a food, to make up for the carbon lost.

The **liquids** of the animal body play an important part in the physiology of animal life, and the most important of these liquids is the **blood** which has the function to supply nourishment to all parts of the animal body, and to remove at the same time all waste matters. From 4 to 8 per cent. of the live weight of an animal is blood. It consists of 75 to 80 per cent. of water in which nitrogenous compounds and salts are dissolved, forming the colourless **blood plasma,** in which again an enormous number of extremely small solid particles—the **red** and **white blood corpuscles**—are suspended. The blood plasma or serum contains about 7·5 per cent. of nitrogenous compounds, and 1·5 per cent. of salts, chiefly common salt, NaCl, and fats, and leaves on ignition about ·85 per cent. of ash. The nitrogenous matters are the proteins, albumin, and fibrinogen; in the mineral portion we find, besides sodium chloride, phosphates of alkalies. Associated with fats we find the

important fatty compound, rich in phosphoric acid, *lecithin*. Other substances found in the blood serum are glucose, traces of urea, uric acid, hippuric acid, creatin, lactic acid, cholesterol, &c., and also gases like carbonic acid, nitrogen, and oxygen. Arterial blood is relatively richer in oxygen, and the venous blood richer in carbonic acid gas.

The **red corpuscles** are flattened circular discs, the size of which varies in the different animals. The corpuscles of human blood have an average diameter of $\frac{1}{3200}$ of an inch, so that more than 10,000,000 would lie on the space of a square inch, and 1 cubic inch of blood contains about 70,000,000,000 of red corpuscles. Each corpuscle consists of a framework—*stoma*—composed of colourless nitrogenous matters and a complex organic colouring matter, **hæmoglobin.** An idea of the exceedingly intricate composition may be formed from the formula proposed for the hæmoglobin of the blood of a dog, as—

$$C_{636}H_{1025}N_{164}FeS_3O_{181},$$

which molecule contains over 2,000 atoms. Hæmoglobin has the remarkable property of uniting with considerable quantities of oxygen and a few other gases, as carbon monoxide and nitric oxide. The oxygen must exist in a loose combination with the hæmoglobin; the blood richest in oxygen (arterial blood) has a peculiar bright scarlet colour, due to the compound *oxyhæmoglobin*, whereas blood deprived of its oxygen (like venous blood) has a peculiar purplish hue.

Besides red corpuscles, the blood contains colourless or *white corpuscles* or **leucocytes,** at the rate of 1 white corpuscle to every 300 to 500 red ones. They consist of simple masses of protoplasm, formed of water, proteins, fat, and glycogen or animal starch. The white corpuscles are of irregular shape, and the shape continually changes as long as they are alive. These bodies seem to be able to act on any foreign matter getting into the blood, and are known to destroy bacteria. It is also probable that these corpuscles produce the peculiar change of clotting or coagulation when blood is shed, by an enzymic action on the fibrinogen.

By the process of respiration the blood streams in the lung come into close contact with air, by being separated only by very thin cell walls, through which a diffusion of gases can easily take place. The blood plasma of the venous blood gives off carbonic acid gas and takes up at the same time a fresh supply of oxygen, changing the hæmoglobin into oxyhæmoglobin of arterial blood. The disappearance of the oxygen from the blood during its passage through the body is due to oxidation of food products and of waste products, and this oxidation takes place in the animal tissues themselves, and causes an increase of carbonic acid in the blood. The nourishment of the tissue is not actually done by the blood itself, but by another important liquid, the **lymph,** which is exuded continually from the fluid portions of the blood through the thin walls of the capillary blood vessels. The lymph, after having done its duty and having become impoverished, is collected again and returned to the blood by the lymphatic vessels. Lymph particularly rich in food materials is collected in the lymphatic vessels—*lacteals*—from the intestines. The lacteals contain, after meals, a milky fluid—**chyle**—consisting chiefly of finely divided fat, which is continually transported to the blood to enrich it with fresh food materials.

Chyme is the peculiar thick fluid, of the consistency of pea soup, produced from foods by the mechanical action of digestion and the chemical aid of gastric juice. This chyme has at first an acid reaction, but as it passes through the intestines it is subjected to the action of bile and pancreatic juice, which neutralise the acids, emulsify the fats, and help in the digestion of starch and proteids. Absorption of the digested food materials takes place in the intestines by the soluble compounds passing through the cell walls into the lacteals, where the chyle is collected.

We see that the blood gains materials (proteins in form of peptones, carbohydrates in the form of sugars, fats, salts, and water) from the digested foods passing through the alimentary canal, gains oxygen from the air inhaled into the lungs, gains materials from the tissue through which it passes, loses carbonic acid gas and water in the lungs, loses materials necessary to the construction and renewal of tissue, loses material, chiefly waste products (urea, mineral and organic salts, and water), in the kidneys, and finally loses water and salts by the skin.

Milk, another important animal fluid, is the natural secretion of the mammary glands, and consists of a watery solution of milk sugar, proteins, and salts, in which numerous very small globules of fat are held suspended. The fat globules give the opaque milky appearance of an emulsion (*Experiment 116*). The proteins of the milk are *caseinogen* or casein, and *lactalbumin;* the salts are phosphates of lime, potash and soda, chlorides, traces of iron salts and of citric acid. Milk also contains small amounts of gases—nitrogen, oxygen, and carbonic acid gas in solution. The average composition of cow's milk is as follows:—

		Per cent.
Water		87·75
Casein	3·0	
Lactalbumin	·5	
Total proteins		3·50
Olien	1·43	
Palmitin and stearin	1·68	
Butyric	·14	
Various	·15	
Total butter fat		3·40
Milk sugar		4·60
Calcium citrate	·16	
Potassium phosphates	·15	
Calcium phosphates	·11	
Sodium chloride	·08	
Various salts	·20	
Total mineral matter		·70

Fresh milk, when tested with delicate litmus paper, shows both an alkaline and acid reaction, but is distinctly acid with phenolphtalein (*Experiment 117*). The fat globules are so small—several milions go to a drop of milk—that they pass through ordinary filter paper. The size of the globules varies in the different breeds of cows.

Eggs.—The eggs of our domestic fowls and of birds in general consist of several parts—the *shell*, *white*, and *yolk*. The hard shell of an egg consists chiefly of carbonate of lime, with a small amount of phosphate of lime and magnesia and organic substances. It is lined on the inside with a thin delicate membrane, enclosing the white of egg and yolk. The white of egg, or albumen, is composed of water, albumin, traces of fats, sodium chloride, and alkali phosphates. The yolk, which lies within the white enclosed in a thin membrane, consists chiefly of proteins and of fat, with which is associated a reddish-yellow colouring matter and small amounts of cholesterin and lecithin.

	Per cent.		Per cent.
White of egg—		Yolk—	
Water	84·8	Water	51·5
Albumin	12·0	Albumin and casein ...	15·0
Fat, sugar, &c.	2·0	Oil and fat	30·0
Mineral matter	1·2	Extractives and pigment	2·1
		Mineral matter	1·4

Eggs contain all the necessary constituents of food, and are highly nutritious.

As over 100 distinct organic compounds are known to exist in a human body, it will be interesting to get some idea how some of the most important compounds mentioned in our lesson help in the building up of a body, and what share the individual chemical elements have in this composition. For this purpose I give two tables, originally published by Prof. A. H. Church in his valuable book, "Foods."

The human body of a man in perfect health, weighing 11 stone, is made up as follows:—

	Lb.	oz.	grs.
Water, in tissues and secretions	109	0	0
Albumin, myosin, in flesh, chyle, blood	16	8	0
Phosphate of lime, bones, teeth, tissues	8	12	0
Fats, distributed throughout the body	4	8	0
Ossein or collagen, in bones and connect tissue ...	4	7	350
Keratin, in skin, hair, nails	4	2	0
Cartilagin and chondrigen, in cartilage	1	8	0
Hæmoglobin, in blood	1	8	0
Carbonate of lime in bones	1	0	350
Neurin, with lecithin, in brains, nerves, &c.	0	13	0
Fluoride of calcium, in teeth and bones	0	7	175
Phosphate of magnesia, in teeth and bones	0	7	0
Chloride of sodium, through the body	0	7	0
Cholestrin, inosite, and glycogen, in brain, muscle, liver	0	3	0
Sulphate, phosphate, and organic salts of soda ...	0	2	107
Sulphate, phosphate, and chloride of potash	0	1	300
Silica in hair, skin, and bones	0	0	30
	154	0	0

Non-metals—

	Lb.	oz.	grs.
O	109	0	335
C	18	10	150
H	14	3	150
N	4	14	0
P	1	12	25
S	0	8	0
Cl	0	4	150
F	0	3	300
Si	0	0	14

Metals—

	Lb.	oz.	grs.
Ca	3	13	190
K	0	3	340
Na	0	3	217
Mg	0	2	250
Fe	0	0	65
and faint traces of Mn and Cu in blood and brain			
	154	0	0

This lesson concludes a series of lessons dealing with the elementary principles of agricultural chemistry. In a few future lessons we shall put the principles learned to practical application, and enter a little deeper into the chemistry of various crops, foods, and fodders, preparation of foods (cooking), milk, and its products.

APPENDIX TO SEVENTEENTH LESSON.

Experiment 112.—Add to some white of egg about double the quantity of water, stir, and filter the liquid through a linen cloth—

(*a*) A little of the clear solution is heated in a test tube; the albumin coagulates and makes liquid opaque;

(*b*) Add portions of the solution in test tubes, strong alcohol, dilute nitric acid, solution of mercuric chloride and of tannin, which will all precipitate the albumin;

(*c*) Add to other portions of the liquid acetic acid, solution of common salt, and tartaric acid, which will not cause a precipitation;

(*d*) The insoluble precipitate obtained by adding alcohol to the solution may again be dissolved by adding acetic acid.

Experiment 113.—(*a*) Allow the fresh blood of an animal to stand for a while to obtain a separation into clot and serum. Test for alkalinity of serum with litmus and with tumeric paper. Presence of soluble albumin in serum may be shown by heating some of the drawn-off clear liquid. The red corpuscles may be separated from the clot by repeated washing with water, or dilute solution

of soda carbonate, leaving, finally, a mass of fibrin. (*b*) Whip the freshly drawn blood with a bunch of twigs, when fibrin will separate out in a thread-like mass, which, after washing with water, is allowed to dry, and forms a hard, brittle, horn-like substance.

Experiment 114.—Add to about 15 cc. of milk contained in a small flask about 10 cc. strong sulphuric acid, shake until all the liquid has assumed a chocolate-brown colour, pour the mixture into a test tube, and allow the fat to separate out by standing for a while.

Experiment 115.—Allow a piece of bone to soak for several days in a beaker containing hydrochloric acid diluted with about 6 parts of water. The mineral matters in the bone will be dissolved out and go into solution, in which the presence of calcium and phosphoric acid may be proved by the usual tests. A tough transparent mass of ossien will remain undissolved, which, after washing with water, may be dissolved by boiling for hours with water.

Experiment 116.—To a test tube full of milk add a few drops dilute sulphuric acid, shake well and filter off the precipitated casein, which carries down also all the fat. The clear filtrate whey contains milk sugar in solution, the presence of which may be proved by Fehling's test. The presence of fat in the curd will be shown when the filter paper with the casein is dried in a water oven, and the paper will show a greasy fat stain. The presence of nitrogen in the casein may be proved by heating a small piece of the dried curd with a little soda lime (a granular mixture of quick lime and caustic soda) in a test tube, when ammoniacal vapours will be given off.

Experiment 117.—Determine the acidity of 100 cc. of milk, after adding a few drops of an alcoholic phenolphtalein solution, by titrating with decinormal caustic soda until it assumes a faint pink colour.

QUESTIONS TO SEVENTEENTH LESSON.

1. What relation and what differences are there between the composition of animal and vegetable bodies?
2. What is the difference between the nutrition of plants and animals?
3. What are the principal proteins of animal bodies?
4. What are animal fats?
5. Which are the most important fluids of animal bodies?
6. What substances are excreted by animals?
7. What is the composition of blood, milk, lymph, and urine?
8. What are the duties performed by the blood?
9. What are the differences between casein and lactalbumin?
10. Describe the composition of eggs, and give the reasons why eggs are a highly nutritious food?

A SIMPLE METHOD OF ESTIMATING FAT PERCENTAGES OF CREAM.

In the first place, make sure that the milk to be separated is of the right temperature—that is, about 90 degrees—the machine is in perfect working order. It takes 1¼ gallons of milk, testing 3·6 per cent.—3·6 per cent. is the average quality of the milk in most dairies—to produce 1 lb. of cream testing 40 per cent., so that from 20 gallons of milk, testing 3·6 per cent., 16 lb. of cream should be produced at a test of 40 per cent. Of course, if the milk is better or poorer in butter fat, the result will be larger or smaller respectively. If these results are not obtained, then there is something radically wrong somewhere, and only most careful investigation and experimenting will discover the cause. The writer knew one farmer who, because he did not get a high test for his first few lots of cream, reckoned dairying would not pay him, and he was just going in to see the factory manager to give him a "piece of his mind." On going into figures it turned out that he had only put through his separator that morning 16 gallons of milk, but received 20 lb. of cream, testing 30 per cent. He was, of course, unknown to himself, obtaining an excellent result from his cows, and a slight twist of the cream screw separator quickly gave him his much-cherished 40 per cent.

Science.

DESTRUCTION OF LANTANA BY SCIENTIFIC RESEARCH.

Mr. N. Joubert, of Terranora Creek, Tweed River, has kindly forwarded us the following correspondence, published in the "Tweed Times," in connection with his investigations into possible methods of eradicating the noxious lantana plant by other methods than the laborious system pursued in Australia:—

Since my settling here in July last, and seeing the great extent of country overrun by the lantana plant, and the great expense attached to clearing it off the land, I cast about to see if some more simple and economical means of getting rid of it could be found. I received from a relative of mine a cutting from a French paper, giving a short account of the success obtained in the Sandwich Islands from the introduction of an insect which eats the lantana seeds. I at once wrote to the English Consul in Honolulu for information, and he lost no time in sending me a report obtained from Mr. Perkins, the Entomologist attached to the Hawaiian Sugar-planters' Association, Honolulu. This report, together with the Consul's letter, seem to me so interesting, and the information they contain so valuable, that I think it should be made as public as possible. With this object in view, I send you copies, trusting that, after perusal, you will see as I do the benefit that may be gained to the country at large by such a simple means of coping with the lantana problem. No doubt great care will have to be exercised in examining this question, but it is worth while. As soon as the farmers and graziers are made aware of the results obtained in the Sandwich Islands, meetings could be called in the various districts, and a course of action decided upon. My suggestion would be that the Government be asked to take the matter up. No doubt Queensland and New Caledonia would join in, and, by a very small tax per acre on the land, which could be collected without expense by adding it to the land tax, the individual cost to each settler would be so small that it would hardly be felt, and would drop off as soon as the outlay incurred was covered.

The sending of a first-class entomologist to Honolulu, as Mr. Perkins suggests, who, with his assistance, would find out all we want to know, would not cost much spread out between so many; and, if the verdict was favourable, the importation could be made. As the lantana insect originally came from Mexico—part of the continent of North America—the latitude of which (like ours) embraces hot, temperate, and cold latitudes, with their various similar introduced flora, it will no doubt be possible to find out if the lantana insect has travelled or caused injury to anything else. Trusting that you will see your way to publish this matter for the general good.—I remain, Sir, yours faithfully, N. Joubert."

[Copy.]

"H.B.M. Consulate, Honolulu,

"23rd October, 1906.

"N. Joubert, Esq., Terranora, Chinderah, Tweed River, N.S.W.

"Dear Sir,—I received your letter of the 14th September last, asking information concerning the importation to these islands of insects injurious to the lantana plant which is such a scourge in Northern Australia, and at once put myself in communication with the entomology division of the Hawaiian Sugar-planters' Association, whence the subject matter of the paper you mention originally emanated. You will see from Mr. Perkins' letter (copy enclosed) that the importation of injurious insects is a point to be taken into

consideration when bringing in kinds which are destructive to the lantana, and for this reason I have also put the Honourable the Premier of New South Wales in possession of the statement of Mr. Perkins, which appears to me of the highest value to the colony at large. You will note that Mr. Perkins says he will be glad to supply you with any special information, and, for my part, I will be very pleased to give you any assistance in my power.

"I remain, dear Sir,

"Yours faithfully,

"(Signed) R. DE B. LAYARD,

"H.B.M. Consul, Honolulu."

"Experiment Station and Laboratories of the Hawaiian Sugar-planters' Association—Division of Entomology,

"Honolulu, 22nd October, 1906.

"R. de B. Layard, Esq., H.B.M. Consul, Honolulu.

"DEAR SIR,—Mr. C. F. Eckart, of this station, has handed me your letter of 27th October ultimo, and a copy of Mr. Joubert's letter therein enclosed. I do not think there is anything of any account published on the lantana insects in addition to the facts given in the "Journal d'Agriculture Tropicale" of a few years ago, that article being taken from my own account published, I think, in the "Hawaiian Sugar-planters' Monthly," a little previously (1902 or 1903), and of which I have no copies. The account in the journal, &c., mentioned by Mr. Joubert is quite correct. The main object of the insects imported was to destroy all the seeds of lantana, and prevent its spread, not to eradicate it altogether, as it is in some respects a most useful plant here. The experiment has been an entire success, and now ranchmen are able to clear their land once for all where previously the same land had to be cleaned every year or two. In fact, the situation had become hopeless till the insects were imported. On the other hand, the introducing of these insects into Australia is a matter requiring the utmost caution, and will no doubt require the services of a first-class entomologist to give all his time to the matter. There are many reasons for this, which cannot be fully stated here, but I may say that the lantana here supports most injurious insects that are not imported by Mr. Koebele, and the utmost care would have to be taken to rear up pure colonies of the special kinds of insects that it is desired to import into Australia without admixture of injurious kinds; also, the whole situation must be reconsidered, for certain kinds of insects can be imported here with impunity which it would be the height of folly to introduce into a country like Australia with a totally different flora. It cost many thousands of dollars to import the lantana insects here, and I anticipate it will cost Australia as much to get them from here to that country. As the work of the insects here is permanent and continuous, the benefit derived can be estimated at millions of dollars, so that the outlay was a good investment for this country. As I myself handled every insect sent by Mr. Koebele, destroying all the injurious kinds, which far out-numbered those which could be introduced, I have the fullest information on all points in this matter, and shall be glad to supply Mr. Joubert with any special information he may desire.

"Yours obediently,

"(Signed) R. C. L. PERKINS."

General Notes.

HOW TO GROW LARGE MELONS.

A very simple method of watering and at the same time manuring melon vines is to sink a cement or bottled-ale cask a little over half its own depth in the ground. Then throw up the soil against the uncovered part of the cask, thus making it the centre of a gradually sloping mound, much like a scrub turkey's nest. Fill the cask with stable manure. Sow the melon seeds outside and at a little distance from the cask. Every day or every second day, when the plants have begun to grow vigorously, water the manure in the cask. The liquid passes between the staves, and thus fertilises the plants. A distinct advantage of this process is that during dry weather, when surface watering would only result in baking and caking the soil, the plants draw moisture and nourishment from below, and thus the soil round the roots is kept constantly moist.

A CURE-ALL FOR PIGS.

While a sick pig is generally hard to cure (says an American writer), there are many remedies prescribed for hog ailments. I have only one remedy for a sick pig, and it is a very simple one. Rheumatism, paralysis, blind staggers, thumps, scours, &c., I treat all alike, though in varying proportions. My cure-all or panacea is nothing more than fresh new milk and turpentine. For a young pig, say, six weeks, I administer a teaspoonful of turpentine in, say, half a pint of milk. Unless the pig is very sick, it will readily drink this. If too far gone to drink, it must be administered with a spoon. An older pig, however, will seldom refuse new milk, even when a tablespoonful is given in a quart or more. I always keep a supply of turpentine on hand, and, when there is anything wrong with the pigs, at once give a dose of turpentine and new milk. It is the best remedy I know of for all the ills that pigs are heir to. Grade the dose from a teaspoonful for a six-weeks-old to a tablespoonful or more for a mature hog. The milk may be given *ad libitum*, or as much as the pig will take to drink freely.

CURING HAMS AND BACON.

The following is in reply to inquiry from a reader:—In doing the above it is well to remember that meat requires a suitable place for storing—where there is a good circulation of air, for ventilation is equally necessary for live creatures and dead meat; also, that salt penetrates meat more quickly in wet than it does in dry weather. From three to four weeks will be required for curing a good-sized pig. The animal is best kept without food for twelve or fourteen hours before being killed, that all blood may drain out of the body, otherwise the carcass will not cure so well. When the hams and sides are cut up, sprinkle them with salt and hang to drain for twenty-four hours. The following is a farm-house recipe for green or unsmoked bacon, although the same may be used even if you purpose having them smoked. This is sometimes done by sending them to a good provision dealer, who will generally do it for a customer:—

BRINE FOR CURING.

Boil together 1 pint of beer, 1 pint of vinegar, ½-lb. coarse brown sugar, 3 oz. saltpetre, and 3 lb. coarse salt. After five minutes' boiling, pour the liquid

over the hams, &c. Turn the meat in the brine once a day for the first week and baste well. For the next fortnight or three weeks turn them every other day. At the end of that time remove from the pickling vat or tub, drain, and hang in a dry cool place for five or six months. When dry, sew up in newspaper bags and then in calico ones. They should, if properly done, keep for two years. Good brine becomes more valuable with age, and may be frequently used if boiled up every month or six weeks and replenished with sugar, &c. Strain and add a fourth part of all the ingredients to make up for waste.

ANOTHER PROVED RECIPE.

To every 2 gallons of spring water put 2½ lb. rough salt, 2½ lb. coarse brown sugar, 2 lb. bag salt, and 8 oz. of saltpetre. Boil together until no steam arises, skim, strain through a coarse cloth, and let it get quite cold. Cut up the meat, put it in the pickling tub, and well rub with equal parts of coarse salt and sugar. Leave for twenty-four hours, and then pour over the cold pickling mixture. It should be well covered with the liquid and each piece be moved every other day for a fortnight, leaving the whole in the brine for four weeks. Hang up to drain in a thorough draught of air; smoke (if liked) for eight or ten days. This is very suitable for sides, belly pieces, &c.

TO CURE BY THE DRY PROCESS.

This method is adopted by many in preference to steeping in brine, and the result is certainly not so flabby. For this, equal quantities of best salt and brown sugar are used with ¼-oz. of saltpetre to every 1 lb. of the mixture. This is thoroughly rubbed into the pork every second day, and the position of the meat changed when so doing—*i.e.*, the top portions are put at the bottom, and *vice versâ*. The time required for finishing will greatly depend on the state of the weather and on the size of the pig.

SHEEP IN ARGENTINA.

Argentina acquired improved Spanish merinos at the same time as Australia; and by 1832 the demand for merinos, due to their success in the Argentine sheep ranches, was so great that upwards of £14,000 worth of rams were sold by the owners of one great stud in a single season. The flocks from which these rams were sold produced sheep giving 6 lb. and 7 lb. of wool, and rams yielding from 10 lb. to 12 lb. of washed wool. At a later date the demand for the best English rams grew up. Lincolns, Leicesters, and Romney Marsh were the most popular breeds, and the Lincoln proved the best adapted to the conditions of life in Argentina. By the early eighties the superior popularity of the Lincoln was generally established, and ten years later it disputed the land with the merino, with which breed it was freely crossed. The establishment of the freezing industry gave a great impetus to crossing, as breeders then began to breed for carcass as well as for wool.

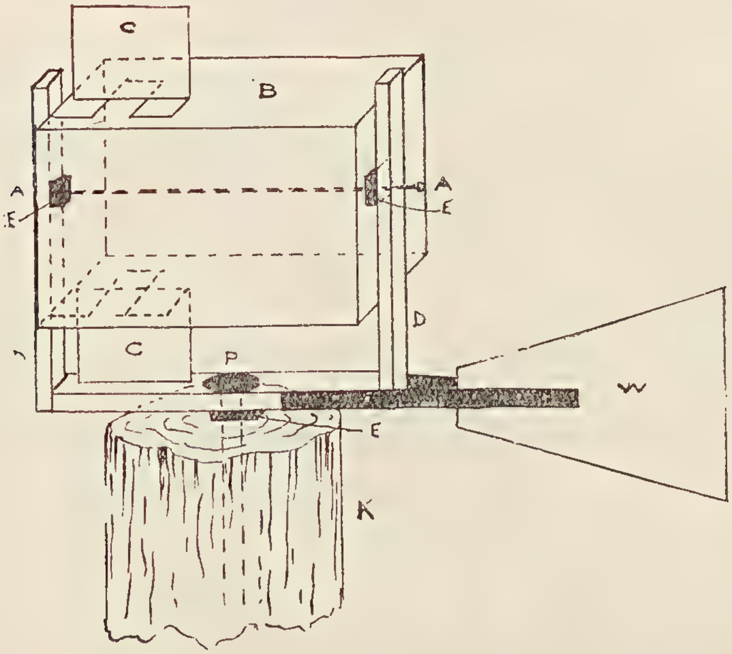
The stock-bearing capacity of the land in Argentina is far greater than that of Australia. Probably there is no country in the world where the natural pasturage is capable of bearing such a great head of live stock. The average rainfall in the province of Buenos Ayres is 30 inches, and the atmosphere is somewhat humid. It is, in fact, a country admirably adapted for long-woolled sheep and their crosses. The wool on Argentine ranches is not washed on the sheep's backs, but is all sold in the grease. Most of it finds its way to France and Germany. Argentine wool is greatly appreciated in France, and at the great Paris International Exhibition of 1889, of the 236 prizes given to the exhibits of wool, no fewer than 102 went to Argentine samples.

A BIRD-SCARER.

Mr. K. H. Laughton, of the Mildura Olive Factory, Victoria, sends the following sketch of what should, with reasonably windy weather, prove an efficient scarer of birds, flying foxes, &c., and possibly the fruit fly, which attack our fruit trees with such deplorable results.

It is described as follows:—

A is an axle made of No. 6 fencing wire, passed through *B*, which is a kerosene tin, and supported by *D*, a light wooden framework. To the four corners of *B* are soldered small pieces of tin, with one corner bent over slightly



like propeller blades. *EE* are washers; *P* a bolt for a pivot passing through the framework into an 8-feet or 10-feet post *K*, which is wired up to a trellis or fence post. *W* is a windsail, which keeps the propellers *CC* facing the wind. One or two small stones are put into the tin, which rotates by a very small wind, and thus a continuous rattle is produced.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

PRUNING PASSION-FRUIT VINES.

H. D. B., Montville.—

How and when to prune a passion-fruit vine which has been in the habit of growing wild, and is it possible to produce a winter crop through pruning? What time of the year is it done for this purpose?

Mr. Benson, Government Fruit Expert, advises—

1. Treat in the same way as a grape vine in trellis—viz., leave one main stem and two laterals;
2. Pruning when vines are flowering in spring, and thus destroying the main summer crop, will throw the crop back about three months;
3. Prune during wet weather, when the vine is making good growth.

NUT GRASS.

THOS. HUNTER, Goondiwindi.—

1. There is no simple remedy for the destruction of nut grass. You might try strong brine on your garden walks.

2. Federation has not caused any change in the rate of postage for the Journal. A subscription of 1s. per annum will ensure its regular delivery at Goondiwindi.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table Showing the Total Rainfall for each Month of the Year in the Agricultural Districts of Queensland.

Stations.	1906.												1907.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
North.													
Bowen	12·84	8·73	6·29	0·78	6·34	0·69	0·04	0·36	3·41	1·76	0·99	11·01	2·53
Cairns	7·00	16·87	16·05	5·20	4·04	3·44	2·28	1·79	1·57	0·56	13·26	11·31	18·36
Geraldton	15·61	37·67	19·67	11·51	7·93	16·05	5 73	6·65	4·26	2·28	21·08	21·20	29·58
Herberton	15·20	3·73	4·67	1·2[illegible]	1·38	1·04	0·59	0·55	0·38	0·30	5·16	10·82	10·56
Hughenden	6·11	3·93	8·47	0·12	Nil	Nil	Nil	Nil	0·92	0·61	0·51	†3·76	1·98
Kamerunga	7·25	13·76	14·93	4·94	4·13	3·55	2·49	2·03	2·56	0·72	10·00	8·17	15·78
Longreach	3·99	8·61	12·25	Nil	0·22	Nil	0·11	Nil	4·11	2·16	0·66	0·51	1·22
Lucinda	10·13	49·97	25·88	10·12	3·77	3·02	0·40	...	Nil	1·85	6·60	*22·36	12·38
Mackay	13·58	9·88	16 57	2·87	11·87	3·85	0·68	0·93	4·35	2·63	1·80	12·93	2·72
Rockhampton	4·24	15·31	8·26	Nil	5·27	1·12	Nil	2·61	3·80	1·07	0·46	5·19	4·15
Townsville	10·05	17·31	4·28	0·38	1·80	0·30	Nil	0·46	3·25	1·45	7·74	14·03	12·49
South.													
Barcaldine	4·00	7·07	13·84	Nil	1·70	0·19	0·10	Nil	2·88	2·92	1·33	1·04	3·44
Beenleigh	4·96	15·11	9·34	0·04	3·57	1·47	0·16	2·94	3·47	2·94	1·75	3·98	4·75
Biggenden	2·27	8·24	4·61	0·45	5·77	1·42	0·48	3·02	5·07	1·19	3·09	†4·55	5·77
Blackall	5·13	11·14	11·99	Nil	1·75	0·22	0·48	0·02	4·70	5·86	1·37	1·96	2·30
Brisbane	4·16	12·71	4·85	0·45	3·23	1·38	0·22	4·21	3·48	3·81	1·07	3·28	...
Bundaberg	6·92	9·92	1·90	1·17	8·44	2·01	0·03	1·86	10·90	1·57	0·97	3·85	3·29
Caboolture	8·11	12·73	6·46	0·49	4·53	0·85	0·29	3·02	4·77	4·73	4·26	3·15	2·53
Charleville	1·29	10·66	3·15	0·07	..	0·13	2·34	0·35	4·99	2·66	1·30	3·71	0·49
Dalby	4·15	4·43	5·15	1·81	0·68	0·87	1·58	2·78	2·65	2·96	2·12	5·67	5·60
Emerald	6·12	7·81	5·22	0·08	2·12	0·17	Nil	1·62	4·47	1·55	2·32	1·79	7·36
Esk	5·49	6·79	9·04	1·74	3·25	0·77	0·38	4·51	4·14	2·90	2·45	5·26	2·87
Gatton College ...	3·75	5·33	9·43	1·40	1·90	0·60	0·41	3·73	3·54	2·25	2·01	3·45	2·62
Gayndah	2·81	9·65	5·86	0·51	5·10	0·48	0·22	2·34	5·14	2·25	4·25	2·82	3·00
Gindie	1·92	9·15	5·92	Nil	2·32	0·05	Nil	1·46	4·57	3·20	2·95	1·45	4·58
Goondiwindi	1·08	2·60	2·19	0·37	2·80	0·98	0·49	4·35	3·33	2·36	2·32	4·04	5·37
Gympie	6·07	7·38	5·58	0·45	6·88	2·26	0·52	3·19	3·97	3·03	4·12	5·32	3·99
Ipswich	5·30	7·22	3·87	0·12	1·67	0·25	0·17	2·59	2·94	2·60	0·71	4·22	2·17
Laidley	3·29	5·63	6·73	0·35	2·83	0·49	0·50	3·26	3·19	2·87	1·78	4·12	2·84
Maryborough	4·46	8·34	6·77	1·08	4·85	2·55	0·15	2·31	6·48	1·22	2·49	4·39	5·44
Nambour	7·01	16·50	9·35	1·13	6·20	3·68	0·61	4·52	8·94	4·89	3·40	6·74	5·74
Nerang	5·01	13·68	10·04	0 87	10·32	1·98	0·12	3·56	6·42	8·26	2·75	6·33	9·86
Roma	2·18	12·95	3·94	Nil	1·09	1·08	1·65	1·47	4·43	2·37	1·32	4·31	6·32
Stanthorpe	6·06	2·76	3·18	2·00	0·77	0·45	1·44	3·37	4·29	2·90	2·49	4·89	4·33
Tambo	5·09	9·05	10·63	Nil	0·66	0·05	0·67	0·07	5·17	2·85	1·23	1·16	4·74
Taroom	1·86	13·73	6·02	0·23	1·04	0·81	0·60	2·30	4·26	1·70	1·35	5·49	5·16
Tewantin	12·07	18·59	7·57	2·27	4·61	5·68	0·39	4·25	6·37	4·38	2·73	9·53	6·38
Texas	3·41	2·11	1·94	1·89	1·57	0·75	0·90	3·22	2·77	3·42	2·23	1·83	4·69
Toowoomba	6·17	6·58	8·87	2·07	2·65	0·85	1·81	3·63	4·55	2·76	2·65	4·11	3·94
Warwick	2·09	2·21	6·27	0·37	0·77	0·57	1·16	3·85	3·13	2·47	2·99	5·50	3·95
Westbrook	5·00	4·01	5·12	0·93	0·50	0·55	1·67	2·80	3·34	3·41	‡	1·48	2·10

* Compiled from telegraphic reports. † Approximate—subject to alteration. ‡ Return not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	FEBRUARY. Prices.
Apples, Eating, per packer, Hobart	12s. to 16s.
Apples, Cooking, per packer, Hobart	7s. 6d. to 12s.
Apples, American, per packer	7s. to 12s.
Apples, Local, per packer	5s. to 6s.
Apricots, Local, per packer	3s. to 5s. 3d.
Bananas, Local, per dozen	1d. to 1¼d.
Bananas, Fiji, per bunch	2s. 6d. to 6s.
Bananas, Fiji, per case	11s. 6d. to 12s. 6d.
Cherries, quarter-case	2s. 6d. to 5s. 3d.
Cape Gooseberries, per quart	1½d. to 2d.
Grapes, per lb.	1½d. to 2d.
Lemons, per case, Local	5s. to 7s.
Lemons, per case	10s. to 15s.
Mandarins	3s. 3d. to 5s. 6d.
Mangoes, per case	3s. 6d. to 5s.
Nectarines, per quarter-case	2s. 9d. to 3s. 5d.
Oranges, Local, per packer	5s. 6d. to 6s.
Papaw Apples, per case	5s.
Passion Fruit, per quarter-case	1s. 6d. to 2s.
Peaches, per case	2s. to 3s. 6d.
Peanuts, per lb.	2½d.
Pears, Imported	7s. to 9s.
Pineapples (rough leaf), per dozen	9d. to 1s.
Pineapples (smooth leaf), per dozen	2s. 6d. to 4s.
Plums, quarter-case	2s. 6d. to 3s. 6d.
Rockmelons, per dozen	6d. to 2s.
Strawberries, per tray	1s. to 2s. 6d.
Tomatoes, quarter-case	1s. 6d. to 2s.
Watermelons, per dozen	3s. 6d. to 8s.
SOUTHERN FRUIT MARKET.	
Apples, per case	5s. to 7s.
„ Tasmanian, per case	8s. to 10s.
Apricots, per gin case	2s. to 4s.
Gooseberries, quarter-case	3s. to 3s. 6d.
Grapes	2s. 6d. to 4s. 6d.
Strawberries, per dozen punnets	4s. to 6s. 6d.
Bananas, Queensland, per case	6s. to 9s.
„ „ per bunch	6s. to 16s.
„ Fiji, per case	7s. to 11s.
„ „ per bunch	1s. 6d. to 4s. 6d.
Chillies, per bushel	6s.
Lemons, per gin case	2s. 6d.
„ Medium to good, per gin case	3s. 6d. to 6s.
„ Extra choice „ „	6s. 6d. to 8s.
Peaches, per box	2s. 6d to 3s. 6d.
Oranges, medium to extra choice, per case	14s. to 18s.
Pineapples, per case	3s. 6d. to 4s. 6d.
„ choice, per case	5s.
„ small „	2s.
Rockmelons, per gin case	1s. 6d. to 2s. 6d.
Watermelons, Queensland, per dozen	8s. to 10s.
„ medium	6s.
„ small, from	3s. 6d.
Tomatoes, Queensland, choice, per quarter case	2s. to 3s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY.

Article.		FEBRUARY. Prices.
Bacon (Pineapple)	lb.	8d. to 9½d.
Barley (Malting)	...	
Bran	ton	£3 7s. 6d. to £3 15s. 10d.
Butter, Factory	lb.	9½d.
Chaff, Mixed	ton	£3 to £4.
Chaff, Oaten	"	£3 17s. 6d. to £4.
Chaff, Lucerne	"	£3 8s. 9d. to £3 12s. 4d.
Chaff, Wheaten	"	£2 10s.
Cheese	lb.	5½d. to 6d.
Flour	ton	£7 15s. to £8 10s.
Hay, Oaten	"	£4 15s. to £5.
Hay, Lucerne	"	£1 15s. to £2 15s.
Honey	lb.	1½d. to 1¾d.
Maize	bush.	2s. 1d. to 2s. 2½d.
Oats	"	2s. 9d.
Pollard	ton	£4 to £4 7s. 6d.
Potatoes	"	£3 15s. to £5 15s.
Potatoes (Sweet)	"	...
Pumpkins	"	...
Wheat, Milling	bush.	3s. to 3s. 2d.
Wheat, Chick	"	2s. 3d. to 3s. 3d.
Onions	ton	£4 10s. to £4 18s. 6d.
Hams	lb.	10d. to 10½d.
Eggs	doz.	6¼d. to 9¼d.
Fowls	pair	1s. 11d. to 3s. 7d.
Geese	"	4s. 6d. to 5s. 1d.
Ducks, English	"	2s. 2d. to 2s. 7½d.
Ducks, Muscovy	"	2s. 6d. to 3s. 7d.
Turkeys, Hens	"	5s. 4½d. to 6s. 2d.
Turkeys, Gobblers	"	8s. 3d. to 13s. 6d.

ENOGGERA SALEYARDS.

Animal.	JANUARY. Prices.
Bullocks	£9 10s. to £12 10s.
Cows	£8 to £10.
Merino Wethers	21s. 9d.
" Ewes	19s.
C.B. Wethers	25s. 6d.
" Ewes	20s.
Lambs	16s. 9d.

Farm and Garden Notes for April.

FIELD.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay, April, May, and June at latest being the months for sowing. The main potato crop, planted in February and March, will now be ready for a first or second hilling up. The last of the maize crop will now have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking should not be begun until the night dew has evaporated, nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangolds, and swede turnips. Plant out paspalum roots. Seed wheat, of whatever variety soever, should be dipped in a solution of sulphate of copper (bluestone), in the proportion of 1 lb. sulphate to 24 gallons of water. The seed may also be treated with hot water by plunging it in a bag into hot water at 120 degrees Fahr. for a minute or two, and then into water heated to 135 degrees Fahr. Allow it to remain in this for 10 minutes, moving it about all the time. Then plunge the seed into cold water and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against bunt, smut, black and red rust is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. Schering's formalin costs about 2s. 10d. per lb., and is sold in bottles. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but, while the latter can be used over and over again, formalin becomes exhausted. It therefore follows that only the amount required for immediate use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient, more on poor land and less on rich soils. On light, sandy soil the wheat should be rolled. On sticky land it should only be rolled when the land is dry; otherwise it will cake, and must be harrowed after rolling. When the wheat is 6 inches high, go over it with a light harrow. If the autumn and winter should prove mild and the wheat should lodge, it should be kept in check by feeding it off with sheep.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

FLOWER GARDEN.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camelias, gardenias, &c., may be removed with safety. Plant out all

soft-wooded plants such as verbenas, petunias, penstemons, &c. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and, after this, get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bone dust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots and plant bulbs as recommended for March.

Orchard Notes for April.

By ALBERT H. BENSON.

The Orchard Notes for March dealt largely with citrus fruits, especial attention being drawn to the importance of taking every precaution, now that the fruit is reaching maturity, for preventing its destruction by the various pests that attack the ripening fruit. At the same time, I pointed out the necessity for the proper handling, sweating, and packing of the fruits, in order that it shall be placed on the markets either of this or the other Australian States in the most attractive manner and best possible condition. All that I stated in last month's Notes applies with equal force to the present month, and in fact as long as the citrus season continues, so that I need not repeat what I then wrote, but will simply draw the attention of all citrus-growers to the importance of my remarks, as it is useless to take every care throughout the year to keep the trees well pruned and free from disease and the orchard in a high state of cultivation if we do not do our best to protect the result of such work and to market it to the best advantage.

With the exception of the marketing of citrus and a few other fruits—such as persimmons, pines, bananas, custard apples, &c.—April is a somewhat slack time for fruit-growers, especially those who depend on deciduous fruits, so that the opportunity should be taken to clean up the orchard before winter, and to finish up any odd jobs that have been neglected during the previous months. Such work will consist of looking after all fences, drains, headlands, &c.; the casting back of soil round trees where same has been washed away by the heavy summer rains; the ploughing in of all weeds and trash that have accumulated in the orchard during the wet season; the removal of all dead or worthless varieties of trees that it is desirable to get rid of; and any other work—such as the collection of material for and making of compost heaps—that may be necessary.

Cyaniding for all kinds of scale insects may be continued during the month, taking care not to treat any trees bearing fruit when same is either wet with rain or heavy with dew, as, if treated under these conditions, the fruit is apt to be marked.

Strawberry-planting can be continued during the month, but the planting of all kinds of fruit trees should be delayed till the wood has been thoroughly matured. Keep the nursery clean, see that all young buds are growing properly, and that all unnecessary shoots are removed; the young tree being trained to one straight stem till high enough to form the future head of tree, when it should be topped.

Plate XII.

MANGOLDS AT THE QUEENSLAND AGRICULTURAL COLLEGE.

Agriculture.

THE MANGOLD CROP AT THE QUEENSLAND AGRICULTURAL COLLEGE.

There were shown at the Queensland Court at the A.N.A. Exhibition in Melbourne, in February last, some specimens of mangolds grown at the Queensland Agricultural College which were "eye-openers" to the Victorian farmers who criticised them. These farmers were surprised to learn that the yield of these roots at the College farm reached nearly 65 tons per acre without manure. Such samples of the capabilities of the rich Queensland soils had much to do with the determination of many Victorians to sell out and go to Queensland. The photograph here reproduced will give some idea of the size of the roots. Mr. John Mahon, Principal of the College, writes as follows about the crop:—

The mangold in question is the Long Red variety, and a number of years' experiments with this and others has proved conclusively that this variety is the best for Queensland, being a very heavy yielder, and possessing good keeping qualities. The crop was planted on an area of 5 acres, and has given a yield of 64 tons 18 cwt. per acre. Many single roots weigh over 40 lb., and, as the crop is still growing, before the whole of it is used the yield will have considerably increased. The roots are now being fed to pigs, and, later on, if required, they will be fed to milch cows and other animals kept on the place. The value of this crop cannot be too strongly impressed on Queensland farmers. The roots will keep in the ground for a considerable time, and may be used up when required. In colder climtes the crop may be stored in pits; this and other methods have been tried here, all of which resulted in failure. The mangold is readily eaten and relished by all animals kept on the place. The soil selected for the crop is by no means the most suitable at the College, a piece having been chosen alongside the road, so as to be an object lesson to farmers when passing to and from the township. I may point out that the lesson taught here during the past seven years has induced many farmers to grow this valuable crop.

Note.—This crop was planted on 28th and 29th May, 1906. The rainfall from those dates to the end of the year was 15·99 inches; rain fell on 48 days, the highest record for 24 hours during the period being 1·74 inches, and the lowest ·01 inch.

LECTURE ON THE NATURAL RESOURCES OF CENTRAL AND NORTHERN QUEENSLAND.

Last January, at the invitation of the committee of the Queensland Teachers' Conference, Major Boyd delivered a lecture on the above subject, of which the following is a *résumé:*—

The speaker stated that during the forty-five years he had lived in this State he had gained an intimate knowledge of the resources of North Queensland. Dealing first with the climate, he said there were four or five climates in Queensland, ranging from the temperate to the tropical. If Queensland had all the resources in the world, and an unhealthy climate, it would avail nothing. But it had a healthy climate, and if only it had the population it could be developed into one of the greatest countries in the world. In the Rockhampton district there was soil which would grow anything. Taking

the train from Rockhampton, and going out West 400 miles, they came to the best cotton district in the State. At Westwood and district there was fine dairying and agricultural land. Crossing the Dawson, and getting over the range, grass was found in abundance. The Emerald country was better fitted for sheep-raising. Going still further West, fine dairying country was found, and it was his opinion that the dairying industry would be one of the great factors in the prosperity of the State. As for Barcaldine, he predicted that it would become the Toowoomba of the West, being in the midst of a magnificent, rich district. Beyond Emerald, to the eastward, were encountered the artesian bores which afforded such splendid opportunities for irrigation and fruit and grain culture. The writer expressed surprise that date culture was not taken up at Barcaldine, and declared that six years after planting sufficient dates could be produced to supply the whole of Queensland. Going North again, Major Boyd referred to Ayr as the great sugar district of the North. There were thousands of acres on the Burdekin delta which would yield wonderful results by irrigation. Proserpine and Bowen were splendid fruit-growing districts. Passing north to Cairns, coffee plantations were found in that district, and cane grew magnificently. Gigantic cedar trees of great value also grew there. Between Cairns and Geraldton there were great tracts of land with beautiful clear rippling streams, but the district was practically uninhabited. On the Johnstone River a banana fibre industry might be successfully started. In the interior, in the Georgetown district, there was a marvellous mineral field. Major Boyd also referred to Charters Towers and other mining centres, and concluded by showing how favourably Queensland and Australia compared with Canada. "Why is it," Major Boyd asked, "that Canada is always upheld as a paradise for the European immigrant? It can only be on account of its nearness to European ports. As for climate, there are six or seven months of winter, and only five months for work. Settlers are sent to the far North-West free of charge, but once there there is no hope of return. The crops which can be grown are limited in number, its climate is rigorous, and provisions expensive. How could such a country compete with Queensland if only due publicity were given to the advantages of this State?" Proceeding, Major Boyd quoted the following happy contrast between Canada and Australia, made by Mr. Jenkins, Agent-General for South Australia:—"As Britishers contemplate the landscape of the Empire there are two great competitors visible—Canada, with a population of 6,000,000, and Australia with one of 4,000,000. Australia exported £57,000,000 worth of products in 1904, while Canada's exports for 1903 were only £46,000,000.

The primary production in Australia is worth £22 15s. 2d. per head of the population, in Canada it is £16 5s. 6d., in the United States £14 14s., and in Great Britain only £7 18s. 6d. This shows Australia's primary production according to population to be about 40 per cent. greater than Canada, 57 per cent. greater than the United States, and 300 per cent. greater than the United Kingdom. The value of gold produced in Australia in 1904 was £16,000,000; in Canada, in 1903, £3,871,000. Australia produced 450,000,000 lb. of wool last year, the United States 292,000,000, and Canada between 10,000,000 and 11,000,000. Australia has between 70,000,000 and 80,000,000 sheep, the United States 51,000,000, and Canada 3,000,000. The export of wheat from Australia in 1904 was 33,346,066 bushels; from Canada it was 16,779,028. Last year Australia sent to Great Britain 51,313,000 lb. of butter, Canada sent 33,301,000 lb., and the United States sent 9,675,000 lb. Australia has deposited in her banks £130,752,000, while Canada has only £110,921,000, giving Australia £32 18s. 8d. per head of her population, and Canada £19 16s." That is a bit of very instructive arithmetic, and Australians as they contemplate it may well feel their native and overpowering modesty somewhat rebuked. To develop these magnificent resources of the State more population is urgently required, and to obtain that population the State should be advertised in the same manner as is

done so persistently by the Canadians. Lately, the Chilian Government has been trying to attract British and other European settlers, and we must hustle or we shall be left in the lurch. We have a practically empty country, covering, in round numbers, 700,000 square miles, with only 528,048 inhabitants, of whom, out of a population of 528,048 in Queensland, there are living in towns 200,000, of whom 21,289 work in factories, 10,641 are goldminers, 121,220 are at school, 3,121 are teachers, 10,648 are engaged in mining other than gold, 12,071 are in hospitals, 500 are in gaol, 1,200 at Dunwich, 1,200 are in lunatic asylums, and 49,000 men and women are engaged in general farming. How many does this leave to assist in developing the resources of the country? This is another little bit of instructive arithmetic, with which these remarks may fittingly conclude.

Mr. J. A. Briggs (South Brisbane), in moving a vote of thanks to Major Boyd for his most interesting lecture, said every school child in Queensland should be taught similar facts, with the aid of a map. To show his own faith in the resources of the State, he was sending two of his sons out on to the land. (Hear, hear.) We must do our best to stop this herding in the cities. The marvellous resources of Queensland would present great attractions to the Eastern nations, and it must be populated by the white race.

Mr. Kidd (Stafford) said that he had visited the district between Cairns and Herberton, and could bear out Major Boyd's statement. No one would believe its resources unless they saw them with their own eyes.

Major Boyd, in acknowledging the vote of thanks, said that he had been careful in what he said, because he knew he was speaking to teachers, who came from all parts of the State, and who could check any erroneous statements. He was very gratified to know they bore out his statements. (Applause.)

NATIONS WHICH HAVE BEEN RUINED BY WEEDS.

Whilst southern farmers are greatly impressed by the fertility and vast extent of the agricultural lands of Queensland, neither they nor the people of Queensland ever give more than a passing thought to the ever-increasing plant pests which, unless vigorously checked, must eventually place thousands of acres of our richest soils beyond reclamation. The worst of these pests are the prickly pear, the Bathurst and Noogoora burr, and the Scotch thistle. The three latter can be dealt with by the farmer or grazier, but the pear defies their efforts, and establishes itself in dense scrubs, which soon become impenetrable by man or beast Thence the seeds are carried by emus and other birds, or by cattle, in their hoofs, to the open plains, which soon are covered with the pest. Yet, no efforts are made to combat it, or if any are made, they are so half-hearted as to be absolutely inoperative.

Again, we have the lantana and *Sida retusa* on the coast lands, the former being difficult to eradicate when once it has spread over the land. Even our rivers are threatened by the spread of the water hyacinth. To such an extent has this beautiful plant increased in the Bremer and Upper Brisbane Rivers that, with every fresh, such as that which occurred in February last, such vast quantities of hyacinth are swept down the river that navigation, even below Victoria Bridge, is seriously impeded. Unless strenuous exertions are made to minimise the pest, there must come a time, and that soon, when water carriage to Ipswich will be a thing of the past.

It is appalling (says "Science Siftings") when one thinks of the amount of damage which has been brought to the vegetation of entire countries by neglect or carelessness. Some countries have so much vitality that they soon recover from any number of scourges, be they famines, fires, or plagues, while others are devastated for ever.

What is now the great desert of Sahara was once, in part, a great forest. This was in the days of the Carthagenians, who cut down the trees to be used

for fuel and building purposes. Corn was planted in the place of the forest trees. This was the state of affairs when the Romans came into possession of this country, and they in turn continued this work of destruction till the forests almost disappeared and the land for miles around was a barren waste.

Year after year and century after century the whole of North Africa was inundated by floods, which washed the soil from the hills, and swamped the valleys. The plain which is now the Sahara Desert had no trees which could absorb the moisture and let it gradually find its way to the sea, so the water ran quickly from its barren soil and left it a sandy waste, scorched by the sun. This mistake was not one of the past from which we have learned a valuable lesson, for even in this enlightened age the error is often repeated. Nations cut down valuable forests and leave the land to the mercy of the winds and storms.

Alaska will show us an instance of this. Great trees once stretched across its landscape, and the land beneath was a deadly swamp The labourers in the employ of the telegraph company felled the trees to make poles which should carry the wires through Alaska across Behring Straits, and then *viâ* Siberia to Europe. These thousands of men cut a wide avenue, several thousand miles long, through virgin forests, only to abandon the project when three-parts finished. When the plans for the Atlantic cable were found to be feasible, the project of the telegraph company was ruined. Instead of restoring the demolished forests, the Government allowed them to be left half ruined, with the fallen trees scattered in all directions. The total damage is already beyond computation.

ENORMOUS TRACTS LOST.

Enormous tracts of the finest grazing land in Tasmania have been ruined by the growth of sweet brier and gorse, and Tasmania has lost the use of its finest river by the spread of watercress, planted years ago by an enterprising farmer, and allowed to go unchecked. The Argentine Republic suffered the loss of hundreds of thousands of its most valuable grazing acres through the ravages of the European thistle. The seeds were imported in the cheap wheat which had been bought for planting, and the farmers, not taking the trouble to sift the wheat from the thistle seed before planting, sowed a crop which has been the ruin of their fields. The harm was planted beyond remedy when the wheat was put in the ground, for the wheat fields were soon covered with a dense growth of thistles, and the land had to be abandoned. It is now an impenetrable thicket, which harbours wild birds and beasts of prey.

The grazing lands of Australia were sown with ruin in much the same way. Less than fifty years ago a large number of Indian-bred ponies were imported from Patagonia. In the long hair of their coats were hidden the seeds of the hated Bathurst weed, which soon took root in the Australian soil, and spread rapidly, utterly ruining the pastures.

The oil fly has damaged the oil crop in Southern Italy to the sum of £6,000,000 already, and there must be still greater loss before the remedy for the trouble is effective. The Italians are alone to blame for existing conditions. For years they have snared and entrapped every kind of bird, both large and small, with the result that Southern Italy is almost depopulated of the feathered tribe. Thus the oil fly increases and flourishes unchecked. The work of importing birds as a preventive measure has been begun, but it will be some years before they materially decrease the hordes of the insect pest.

FORMALIN FOR WHEAT RUST.

Further evidence (says the "Brisbane Courier") has reached Mr. J. McAlpine, Vegetable Pathologist of the Victorian Department of Agriculture, of the successful results attending the use of formalin for rust in wheat. Mr.

A. N. Hutchings, a farmer at Lubeck, has written to Mr. McAlpine, informing him that for three years past he has used formalin with great success, and he has not had the slightest cause for complaint with the germination of seed. Mr. Hutchings considers that the farmers in his district who complain that the formalin has a deleterious effect on seed germination do not know how to properly use it. He states he is careful to use exactly 40 gallons of water to 1 lb. of formalin. "We have always had," he states, "freedom from smut with the formalin treatment, and the wheat seems to germinate much more quickly than when treated with bluestone."

BRANCHING RED KAFIR.

A Thrifty Crop.

Mr. D. Macpherson, manager of the Biggenden State Farm, sends us the following favourable account of the Branching Red Kafir corn, which produced this season at the rate of 70 bushels of grain and 15 tons of green fodder per acre in addition:—

I have grown this crop for three successive seasons. First, in an experimental plot. The yield was not good, as most of the heads were very small. A few of the best heads were saved, and the following season one-fifth of an acre was sown with seed taken from these selected heads. From this plot I harvested 9 bushels of grain, or at the rate of 45 bushels per acre. The best heads were again saved, and the following season another fifth of an acre planted. I have just threshed out this crop, which has given me slightly over 14 bushels of seed (56 lb. to the bushel), or at the rate of 70 bushels per acre. There was also a good deal of grain that would not readily leave the heads. These heads, with whatever grain was left on them by the thresher, were fed to the horses, which ate them greedily.

As only the heads were harvested, about 5 tons of green fodder, or at the rate of 15 tons per acre, was left on the plot; this is now being chaffed and fed to the horses, and they seem to like it as well as any of the other sorghums. Any of it that may be left when I am ready to fill my silo will be made into silage.

For fattening stock or working horses the grain of the Red Kafir is almost, if not quite, equal to maize.

Every ounce of the plant is of use as a fodder.

Cut off the seed heads when ripe and the stalks can be chaffed, and either fed green or made into ensilage.

The seed heads, with whatever seed adheres to them after threshing, may be fed to the horses with advantage.

The crop will stand dry weather better than maize. Once the plants are through the ground, dry spells such as we repeatedly get during the spring months do not do them much harm, provided the land was in good order when planted and proper attention is paid to scuffling

In fairly good seasons a second crop may safely be counted on. This, however, will seldom come up to the first crop, either for grain or green feed. The figures given apply in every case to the first crop only.

THRESHING OF BARLEY.

Injury Due to Bad Threshing.

Complaints are frequently made by brewers and maltsters of the injury done to barley in the process of threshing, owing to the fact that the drum of the threshing machine is set so close that many of the grains are cracked or broken. The presence of such injured grains greatly reduces the value of the

barley for malting purposes, as the broken, bruised, or skinned grains fail to germinate, and soon show signs of mould, thus leading to unsoundness in the malt and bad results in the brewery. The injury caused by over-dressing is not limited to grains which are actually broken; grains closely nipped at one or both ends, or such as have been bruised and peeled, are equally objectionable. In fact, if by too vigorous threshing the husk of the barley is damaged, although the damage may not be apparent, irregularities in the malting, accompanied by the production of mould, are likely to result.

To Prevent Injury.

1. When farmers commence a day's threshing they should at the outset, and repeatedly during the day, carefully examine the grain. If any signs of injury are observed, the concave of the drum of the machine should be slightly opened. It is better that part of the beard should be left adhering to the grain than that any risk should be run of injuring the reputation and value of home-grown barley on account of broken and chipped grains.

In this connection, Mr. Baird, a leading maltster in Scotland, in an article on the "Overdressing of Barley," which appeared in the journal of the Highland and Agricultural Society in 1902, pointed out that if, in order to get all the grain out of the ear, especially when the barley is difficult to thresh, the drum and concave are set too close, there is obviously more danger of breaking and "nibbing" than when they are not so closely set.

2. A new machine will break the grain more than a machine which has been used for a time, and in which the roughness of the beaters has been worn off. On the other hand, when a machine has been much worn, the centre of the drum and concave having had the most work, in consequence of the feeding being necessarily more in the centre than at the ends of the drum, the space between them is greater in the centre than at the two ends, and if they are set to thresh clean in the centre they will be too close at each end, and consequently damage will occur. This fault can only be remedied by putting on new drum-beaters and concave ribs.

3. Great attention should also be paid to regularity of feeding. The mill should be driven at an even speed, and proper care should be taken over the adjustment of the several parts of the machine.

4. It is not only in the drum of the threshing machine that unnecessary damage to the kernel takes place through imperfect setting of the several parts, but also in the barley-awner or hummeler, through which the grain subsequently passes. Here, if the beaters are set too closely, and the barley is roughly handled, "nibbing" will take place.

Different varieties of barley require different treatment, so that those in charge of the threshing should make a point of constantly examining the sample, and if this is injured in any way, of ascertaining in what part of the machine the injury occurs, altering the setting until it is remedied.

5. As a further guide in threshing, it may be added that on no account should the barley be rushed through the machine, as it is better to be content with a moderate output and a more perfectly threshed sample.

6. Heavy bushel-weight is no longer required by maltsters, and such barley does not command a higher price, grain of moderate weight being preferred to a sample of heavy weight. This may be emphasised by stating that barley weighing naturally from 54 lb. to 56 lb. per bushel is preferable to barley weighing 56 lb. to 58 lb. per bushel.

7. It is important that the machine should be thoroughly clean in all parts before commencing the day's threshing.—Board of Agriculture and Fisheries, London, Leaflet 149.

A GIGANTIC WHEAT CROP.

Australia can do big things as well as America, says "Garden and Field."

The honour of growing the largest wheat crop in Australia belongs to Mr. G. H. Greene, M.L.C., of Iandra, near Young. This season's crop, which is estimated to reach 80,000 bags, and possibly more, was sold lately on private terms to Messrs. W. R. Cave and Co., the well-known Adelaide wheat firm, who recently established a branch of their business in Sydney. The purchase money will amount to over £50,000, which is stated to be the record sum paid for any one crop in the Commonwealth. In the absence of Mr. Greene in Europe, the negotiations were carried out by his manager, Mr. J. Murray. Last year's crop, which totalled over 50,000 bags, was purchased by Messrs. John Darling and Son, and a crop several seasons back was just short of 70,000 bags.

The crop has been sold on the land before stripping, and the quality of the grain, a good part of which is Federation and Purple Straw, is said to be excellent. It is thought that the whole of this great crop will average fully 20 bushels to the acre, and in places will go as high as 32 to 40 bushels. It is just here that Australia can learn a useful lesson from the United States of America. Rapid methods of saving and marketing by elevators on farms and railways are only beginning to be introduced, whereas they are running in full force in America. Crops like the one in question demand the most improved machinery, and only when that has been brought into general operation will Australia reach the highest pinnacle of success and become what she ought to be—the greatest wheat-producing country in the world.

LABOUR AND IMMIGRATION.

Referring to the development of the frozen meat trade in Argentina, the "Brisbane Courier" says:—

Argentina is a country rather under one-third the size of Australia, and twice the size of this State, comprising fourteen provinces and ten territories. The population of the provinces in 1895 was 3,850,000, and in 1904 about 5,250,000. That of the ten territories adds another 150,000, making the whole country's inhabitants number rather under 5,500,000. Of late years Canada has been held up to the public gaze as a shining light as regards a settled and active policy of immigration. In the five years from 1901 to 1905, altogether 620,000 people arrived there, the far greater proportion being from the United Kingdom, though a fair number of Europeans is included in these figures. It will probably surprise many to learn that in the five years between 1900 and 1904 almost as many people emigrated from Europe to Argentina as to Canada, the number reaching 610,000. In ten years the country's inhabitants have increased by nearly 1,500,000. A very large proportion of the immigrants came from the countries of Southern Europe, the climate constituting no great change to them from that experienced in their native land. In comparison with these two countries, Australia, from a population point of view, has simply stagnated. Fortunately, a new policy seems shortly to be initiated, and steps about to be taken to attract people to our shores. Alongside Canada, Australia can put forward a vastly wider and superior range of attractions for people desirous of settling on the land, and alongside Argentina, at least equal attractions. Our Melbourne correspondent advises that Mr. Deakin has had numerous applications from this State to indent labour. The Prime Minister is causing the fullest investigation to be made, no doubt with a view to the fulfilment of the requests made. So much has been written on the subject of paucity of people and the urgent need for immigration that their reality is now unquestioned. What is required is to set the tide of emigration flowing in our direction in a steady stream, judicioully regulated so that no strain may be placed upon the country's powers to absorb the same, and no dislocation of existing labour conditions caused thereby.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 28TH FEBRUARY, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Cocoa ...	Jersey	13 Dec., 1906	857	4·7	45·11	
Carrie ...	,, ...	3 Dec. ,,	721	4·2	33·92	
No. 48 ...	Ayrshire Sh'rth'rn	30 Nov. ,,	734	4·1	33·66	
Whitefoot ...	Holstein Sh'rth'rn	7 Nov. ,,	819	3·7	33·72	
Careless ...	Jersey	2 Nov. ,,	711	4·2	33·45	
Gin ...	Shorthorn ...	1 Jan., 1907	700	4·2	32·94	
Dripping ...	Holstein Sh'rth'rn	28 Nov., 1906	777	3·8	32·89	
Linda ..	Ayrshire ...	12 Nov. ,,	736	4·0	32·89	
Rosebud ...	,, ...	3 Sept. ,,	655	4·3	31·59	
Grace ...	South Coast ...	28 Jan., 1907	829	3·4	31·19	
Dot ...	Shorthorn ...	18 Aug., 1906	625	4·6	32·20	
Blanche ...	Ayrshire ...	18 Nov. ,,	629	4·4	30·91	
Ivy ...	Jersey	17 Jan., 1907	650	4·2	30·58	
Count ...	Shorthorn ...	20 Nov., 1906	780	3·5	30·27	
Honeycomb	,, ...	19 July ,,	589	4·5	29·78	
Nell ...	,, ...	25 Jan., 1907	759	3·5	29·45	First calf
May ...	,, ...	31 Oct., 1906	674	3·9	29·32	
Wonder ...	,, ...	7 Dec. ,,	713	3·6	28·52	First calf
Cuckoo ...	Jersey	27 Dec. ,,	607	4·2	28·55	
Rhubarb ...	Ayrshire ...	18 Jan., 1907	705	3·6	28·20	First calf
Bee ...	Jersey	27 Dec. 1906	584	4·3	28·15	
Winnie ...	Shorthorn ...	11 Sept. ,,	696	3·6	27·84	
Pleasant ...	,, ...	9 Nov. ,,	682	3·6	27·28	
Restive ...	,, ...	3 Aug. ,,	572	4·1	26·24	
Friz ...	,, ...	30 Oct. ,,	685	3·4	25·77	
Bangle ...	,, ...	31 Dec. ,,	632	3·6	25·28	
Mona ...	Holstein Sh'rth'rn	16 Jan. ,,	605	3·7	24·90	

BAIL AND GATE FOR MILKING-SHEDS.

We have here illustrated a handy bail and gate for milking-sheds, designed, constructed, and worked by Mr. David Alcorn, of Springbank, Mutdapilly. The advantages claimed for these appliances are:—

1. A child can operate them in perfect safety from the rear.

2. A saving in time—no backing up or turning round—the cow walks straight through the bail, which draws back both at the top and bottom; simultaneously the gate moves back an equal distance. Two steps, and the cow is in the grass paddock.

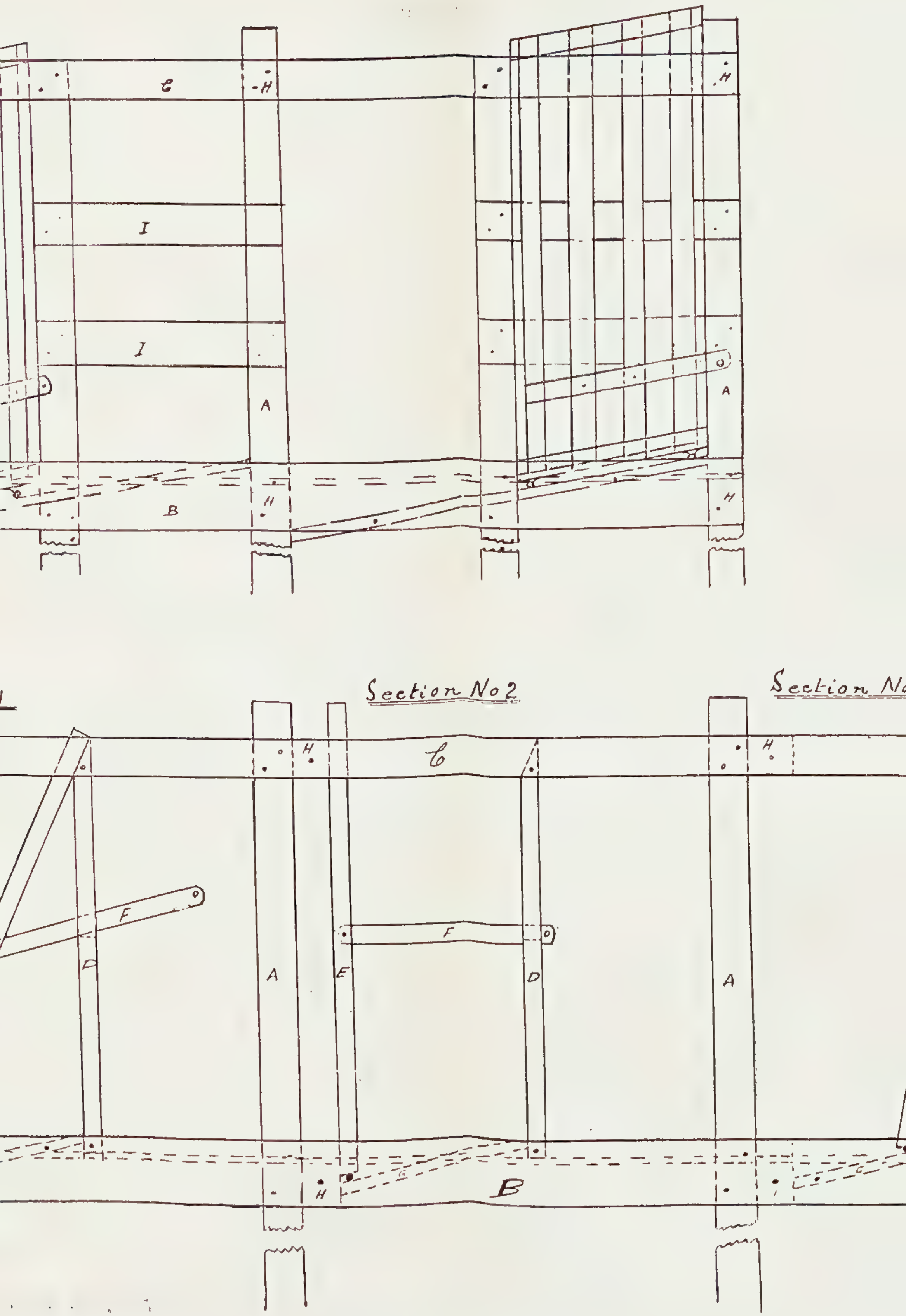
3. The gate and bail-stick adjust themselves for the next customer—the gate, by running back into its place in front of the bail; and the bottom end of bail-stick flying back to its place when the hand of the operator is removed.

4. Crowding milked and unmilked cows together is thus entirely obviated, and the risk of ripping, tearing, and swearing is non-existent.

5. The bail and gate are easily constructed by any handy man.

SPECIFICATIONS OF BAIL AND GATE AS PER ATTACHED TRACING.

Bail.—This is shown on the tracing in three sections—1, 2, and 3. Section 1 shows the bail open to receive the cow. Section 2 shows the bail closed,



Improved Cow-bail and Gate.

and how it is held in that position. Section 3 shows the bail open at both top and bottom, to allow the cow to go out.

Construction.—The whole is constructed of hardwood timber, bolted together, as shown on the plan.

Posts.—A represents the posts on which the bail is built, and may be either round or sawn timber. If sawn, the corners next the cow's neck should be rounded, and may be of any size considered substantial enough for the purpose. These will be sunk into the ground about 2 feet, standing 6 feet 6 inches out of the ground, and 6 feet wide apart from centre to centre. The post to be bolted to the rail that divides one bail from the other.

Planks.—Hardwood planks, 10 inches by 1 inch, marked B on the plan, are let into the posts already mentioned, leaving a space of 2¼ inches between, and securely bolted level with ground, as shown.

C.—Hardwood planks, 6 inches by 1 inch, let into both sides of the posts 6 inches from the top, leaving a space of 2¼ inches as in the case of the bottom planks, and bolted.

Posts.—A 3-inch by 3 inch hardwood post (D) is fixed 3 feet from the bail post, between the top and bottom planks, and bolted as shown. This post has a long mortice to allow the bail catch to move upwards easily; the top end is shaped as shown.

Bail-stick.—The bail-stick (E) is of hardwood, 3 inches by 2 inches, 6 feet 3 inches long, having a long-shaped mortice near the centre, about 2 inches deep, to receive the end of the bail-catch. The bottom end to be cut on an angle, and fitted with a small wheel.

Bail-catch.—A hardwood batten (F), 3 inches by ¾-inch, is fixed to the bail-stick with a bolt, leaving sufficient room to work easily. The other end to have a notch near the end to catch in post (D) at the mortice, holding the bail-stick securely in place.

Inclined Bottom.—A piece of hardwood (G), 2¼ inches by 2 inches, is fixed between the bottom planks extending from the block marked H to the bottom of the post marked D, with a fall from right to left of 6 inches. This piece will form an inclined bottom to the 2¼-inch space above mentioned between the planks, and bolted through as shown.

Blocks.—H represents blocks of harwood, 2¼ inches thick, 6 inches wide, and 10 inches long for the bottom, and 6 inches long for the top, put in position between the planks and bolted. The block at the bottom is meant for the bottom end of the bail-stick to bump on, and the upper one to prevent the bail-stick closing too tightly on the cow's neck.

Concrete Line.—I represents the concrete line, 2½ inches from the upper edge of the bottom planks.

Gate.—This is shown in two sections—section 1 shows the gate closed, and section 2 shows it open.

Posts.—A represents the posts forming the side of the yard or shed, sunk in the ground to a sufficient depth to suit the purpose, and standing out at least 6 feet 6 inches. The insides, or bail sides, of these posts are faced so as to give an even line on which to fix the planks. The main posts will be put in 6 feet apart from centre to centre. Another post, also faced, is put in 2 feet 6 inches away from the post on the left, and just as high as the top edge of the top planks.

Planks.—B represents hardwood planks, 10 inches by 1 inch, fixed as follows:—The first plank is placed in position along the faced posts at the ground, and well spiked or bolted thereto. Then block H, being 2¼ inches thick, 10 inches long, and as wide as the post the other way, is spiked to the planks already fixed; then the second plank is put in position and spiked or bolted. This will leave a space of 2¼ inches in which the gate will run.

Top Planks.—The top planks (C) are put on 6 inches from the top of the main post in every particular as the bottom ones. The first planks put on, both at bottom and top, are spiked at the centre post; heads of spikes or bolts to be countersunk, so that the gate may work between the planks with freedom.

D represents the bottom and top rails of the gate, and is of hardwood, 3 inches by 2 inches, morticed as shown for 4 3-inch by 1-inch bars. These mortices to be made on an angle, so that when the gate is in position the bars will be plumb.

E represents bars of the gate pegged top and bottom, the bottom rail to be supplied with two small wheels, about 2 inches in diameter, held in position by iron fasteners countersunk.

F is a 3-inch by 1-inch piece bolted to the bars of the gate on the inside.

A piece of hardwood (G), 2¼ inches by 2 inches, is fixed in space between planks and bolted as shown, with a fall from right to left of 10 inches; this forms an inclined bottom on which the gate runs.

H.—Blocks put in where shown on plan, and already described when fixing planks.

I.—Two rails fixed to inside of centre on right-hand posts to close this space; these are of 6-inch by 1-inch hardwood, spiked on.

J.—Line of concrete, 2½ inches from the upper edge of the plank.

K.—The distance between the gate and the bail will be 20 inches, to allow room for the cow's head.

All posts and rails dividing one bail from the other may be made of round timber.

CREAMERIES IN DENMARK.

Every care is taken by the Danish authorities to ensure cleanliness in dairies and creameries, and to this end cards are issued containing instructions for the general treatment and milking of cows.

At the top of the card are the words, "Good Advice," beneath which is a drawing of the udder and teats of a cow, with the hand of the milker placed in proper position. On either side of the card are columns shaded to indicate the percentage of fat present in the first milk drawn. The rules on the cow are as follows:—

MILKER, MARK THIS WELL.

(1) The cow is a living machine.
- *a.* Kindly treatment entails less labour and gives more milk.

(2) Good work improves the living machine.
- *a.* Milk clean. Clean milking develops the udder and increases the quantity of milk, and—
- *b.* You receive richer milk.
- *c.* Remember that the milk last drawn is by far the most valuable.

(3) Cleanly milking.
- *a.* You should wear tidy and clean clothes;
- *b.* Have the pail clean as well as the creamery can;
- *c.* Thoroughly clean the udder by rubbing with a piece of linen;
- *d.* Wash the hands thoroughly before milking;
- *e.* Let the udder be quite dry before you begin to milk.

(4) Carry out the work properly.
- *a.* Milk with dry hands;
- *b.* Seize the teats with the whole hand;
- *c.* Keep a gentle pressure on the udder;

d. Milk as fast as you can, and never cease working until the milk is wholly drawn;
e. Don't strain the teat beyond its natural length;
f. Remember the value of the last drops.

(5) Healthy state of the udder.
a. If there be soreness or lumps in udder or teats, stoppage in milk canal or unnatural coloured milk, don't mix that milk with any other, and don't send to the creamery.

(6) Milking times.
a. Begin milking always at fixed time;
b. Milk the same cows in the same order.

(7) Regard this excellent work as one of honour.

FARMER, MARK THIS WELL.

(1) Clean the cows.
(2) Have good air in the stalls.
(3) Light should be freely admitted.

The above rules, which are faithfully carried out, tell why Danish butter is ahead of all the world in all the markets of the world.

The committee close their report with this tribute as to the fine character of the Danish farmers:—

"The most interesting feature in every form of co-operation in Denmark is the extraordinary fidelity universally observed towards their own institutions by the people who participate in them. A member of a Danish co-operative society, deliberately violating the rules, would have certainly a very uncomfortable time of it in his own district. Every one feels that the creamery has been organised to develop the people's industry, and that with its success or failure the welfare of the people must stand or fall, and it is really astonishing the extremely few cases in which expulsion of members took place because of fraud perpetrated on their society. In this way co-operation has materially assisted in the development of Danish character."

REMEDY FOR TICK FEVER.

In accordance with instructions, Mr. A. H. Cory, M.R.C.V.S., Veterinary Surgeon to the Department of Agriculture and Stock, reports that up to the present time the best treatment he has found for cattle suffering from tick fever or redwater is as follows:—

To successfully treat animals suffering from this disease, medicines must be administered in the earliest stages. The first symptoms usually noticed with milch cows is that the secretion of milk is somewhat diminished, although the animal is generally otherwise apparently healthy, and still feeding; but, if the temperature of the animal is taken with a clinical thermometer, it will at once be seen that there is an increase of temperature—viz., from about 101·3 degrees Fahr. (normal), to probably 105 or 107 degrees Fahr.—this is when treatment is of the greatest value, and I would recommend the following: —6 to 12 oz. each of Epsom salts and common table salt, and 2 to 4 drachms of carbonate of ammonia, given in 5 pints of cold water, to which some 3 or 4 lb. of treacle can be added beneficially; to be followed every 4 hours by giving 2 to 4 drachms of carbonate of ammonia, 40 to 60 grains of quinine, and about 40 drops of tincture of aconite, in a pint of cold water or gruel.

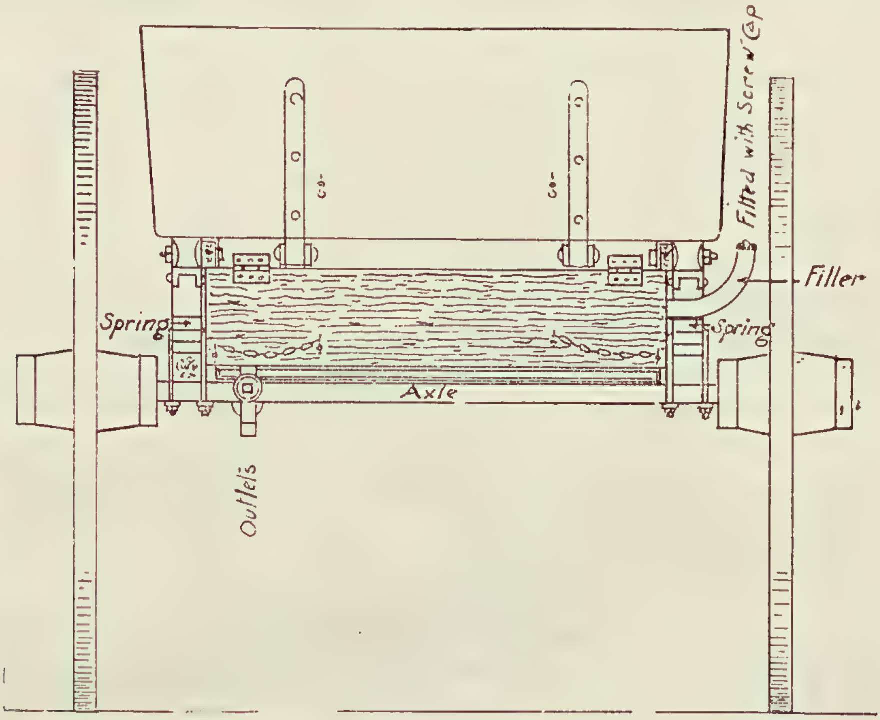
For young or small animals the smaller doses of the above medicine should be given.

It is essential to drench animals slowly and carefully. If they want to cough, or it appears that the medicine is going into the trachea (wind pipe), the head should be immediately lowered and released for a few minutes.

WHEY OR SKIM-MILK CARRIER.

From the annual report of the Department of Agriculture of New Zealand for 1906, we take the accompanying illustration of an improved tank for carrying the whey from the factory to the farm, which can be built under an ordinary milk cart.

1



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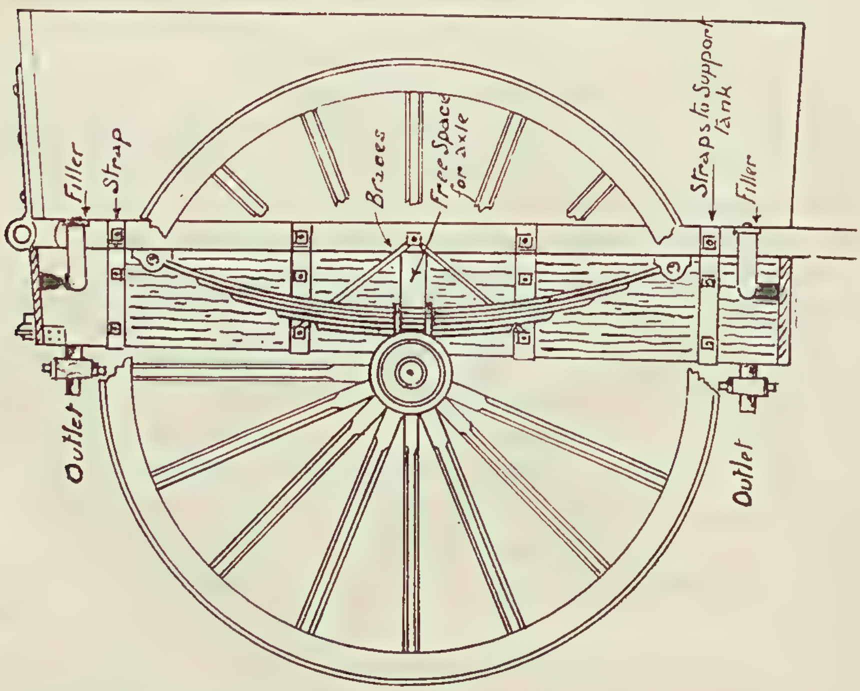
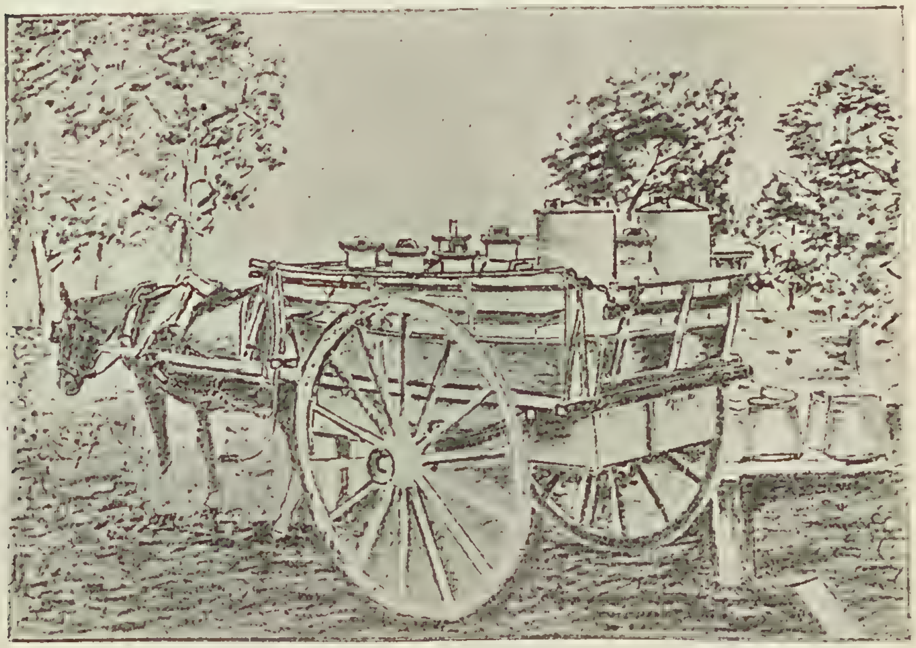


1. End view of Skim-milk or Whey Carrier, showing hinged door for permitting tank to be drawn out and cleaned.
2. Section and side view of Carrier suspended under an ordinary milk cart.

Mr. J. A. Kinsella, Dairy Commissioner, Wellington, N.Z., says on this subject:—

"Another matter which I have often referred to in bulletins, annual reports, and from the platform, is that of returning the whey to the farms in the milk cans. This practice is one which, at many factories, is the cause of a deal of trouble in the direction of producing undesirable, and, very often, off-flavoured cheese. I am pleased to state that at some of our factories it was made a rule that, after the 1st October, supplies must *not* return whey in the cans in which the milk is delivered to the factories. While I am glad to note this, I regret that this practice was not made compulsory throughout the whole season, for I am of opinion that it is just as important for the reputation of the factories . . . . that the quality and make of our spring and autumn cheese should be as fine as that of our summer makes."



New patent Whey or Skim-milk Carrier suspended under an ordinary farm dray, at the Edendale Factory, Southland.

THE YEAST TREATMENT FOR BARRENNESS.

A remedy that may be useful in getting some non-breeding cows with calf is prepared as follows:—Take an ordinary 2-cent cake of yeast, and make it into a paste with a little warm water. Allow this to remain in a moderately warm place for twelve hours. Then add 1 pint of luke warm, freshly boiled water, mix, and allow to stand for another twelve hours. Prepare this mixture twenty-four hours before the cow is expected to come on heat, and inject it into the vagina the moment she is seen to be in season. Breed her at the last of the period.

The theory upon which the use of this mixture is based is that certain bacteria invade the generative organs of the female, and give rise to an acid condition, which destroys the female ova and the male spermatazoa. The yeast is supposed to penetrate to every part of the organs, to destroy the bacteria, and incidentally to neutralise the acids which are destructive to the sexual fluids.

Dr. Peters, of the Nebraska Experiment Station, is credited with the promulgation of this theory, it having been suggested to him from a French medical book or journal. The practice is wholly experimental as yet, and the experience of any who may try it would be appreciated by others.—"New Zealand Farmers' Weekly."

The Horse.

NOTES FROM THE LIVE STOCK JOURNAL.

CARE OF HORSES' FEET.

It is scarcely a matter for wonder that so many horses go wrong in their feet, when the results of careless or incompetent shoeing and the amount of usage the hoofs experience are considered. Even horses which are driven slowly are subjected to almost as much risk from the effects of wear and tear as is the animal which moves faster; for, though the latter, and especially if he happens to be a high mover, places his feet down harder than the other, the slow mover puts them down considerably oftener. It has been calculated that a horse working at a slow pace will move his feet up and down over 11,000,000 times in the course of a hard day, and about 8,000,000 times during a moderately hard one; whereas an animal worked at a trot puts down his feet some 7,000,000 times if he has a hard day out, and about half as many in the course of a moderately hard one. Assuming that these figures are worthy to be accepted—they are the work of an eminent veterinary authority—an idea will be derived from them of the risks of concussion to which horses are liable, with the possible result that some owners will devote more attention to the treatment of their animals' feet, especially if they work on hard ground.

OLD TRAMP.

Thoroughbred blood was introduced in the Great Tableland country in North Australia, called "the pick of the North Australian pastoral lands," by a New Zealand bred horse called Old Tramp, under curious circumstances. Old Tramp had been sold to a New South Wales buyer, who raced him for a time, then put him to the stud, and later sold him to go to India. In company with a number of other horses and mares, he was shipped for Calcutta, but the vessel was wrecked in Torres Strait, and many of the horses died from exposure. The manager of a great ranch, called Eva Downs, hearing of the incident, went along the coast to the wreck and bought what horses remained alive. Among the survivors was Old Tramp and some well-bred mares; these formed the foundation of the stud on what has since been known after the horse as "O.T." Station.

BIG JUMP BY A COLT.

A remarkable jump by a nine-months-old colt, got by a thoroughbred out of a hunter mare, is told. The colt was in a field with his dam, when the groom in charge came and took the mare away, shutting the youngster in the field. The colt began to grow restless when he saw his mother disappearing, and, after galloping once round the field, went straight for the stone wall which surrounded it, and cleared it without touching. The place where he jumped was afterwards measured and found to be 5 feet 7 inches from the ground to the coping.

GRASS FOR SICK HORSES.

The value of grass as a cure for sick horses cannot be over-estimated. It beats all the drugs—at least, that is what we are told by a leading veterinary surgeon. He is convinced that, by hook or by crook, horses should have some little amount of grass daily. Grass to horses, when one thinks about it, is the equivalent to what fresh vegetables and fruit are to us. A horse's craving for it proves the need of it. When they gnaw the bark of trees, or eat leaves, it is because they are craving for grass and cannot obtain it.

BRUMBIES.

Thirty-five years ago, when the horse-breeding industry in Queensland was young, large mobs of horses used to be driven into Toowoomba, about 60 miles from Brisbane, for sale. Many of the animals were well bred, being by imported thoroughbred sires, such as Lord of the Hills and Leopold, and arrived in the pink of condition. These would sell at from £8 to £15 per head; and these prices were so remunerative that men would make a business of trapping the wild horses, "brumbies" on the ranges, by erecting calico "wings" and fences, which led to extemporised yards. The wild horses thus caught included some very fine upstanding animals, and also plenty of weeds. These were sold at from 2s. 6d. to £3 per head, and it was not uncommon to buy a pound's worth of horses in a pen and get seven or eight for the money.

QUEENSLAND TIMBER.

The magnificent exhibit of Queensland forest and scrub timbers, both hard and soft woods, attracted much attention at the late A.N.A. Exhibition in Melbourne, and excited universal admiration. The timber merchants, saw-millers, and furniture-makers of the southern capital are prepared to give orders to a very large extent for supplies of these timbers, especially of crowsfoot elm, silky oak, and maple. One firm, we understand, can use up 50,000,000 feet per annum of American hickory, for which our crowsfoot elm is an admirable substitute. It is enormously tough, elastic, and pliable, and possesses all the qualities of the true hickory. Unfortunately, even the Queensland sawmillers cannot obtain full supplies, in consequence of the difficulty of haulage from the forests. Inquiries have been made in Europe for Queensland cedar for pencil-making. This use for our cedar is problematical. A few years ago we took a sample of red cedar to a pencil-making factory in Cumberland, and the proprietor stated that the timber was not suitable for pencil-making. On the subject of timber supplies, the "Northern Planter," of 21st February, says:—

During the week Mr. G. G. Barnett, of the Tully River, paid a visit to Ingham, and gave a representative of this paper some information regarding the district. Mr. Barnett is the proprietor of a sawmill at the Tully, and says that he is always kept well supplied with orders—in fact, he has more than he can fill at present. He has had orders on hand from Ingham for three months past, the difficulty being that he cannot get the timber in from the bush, owing to the continued wet weather, as there are no facilities for bringing timber to the mill other than by teams or floating it down the river. Silky oak, he says, is in most demand, and his operations are confined mostly to that wood or maple. The latter he regards as about the best for boat building, and it is also a first-class article for making furniture. On one occasion he received an order for 30,000 feet of maple from Sydney, it being required for furniture and ship's fittings, but, as he could not supply it at the price quoted, he was compelled to decline business.

There is a big belt of good country—scrub and forest—in the district, but it badly needs opening up. At present there is no means of outside communication other than by the weekly boat, and settlers have practically to build their own roads. At Cardwell, nearly all the men engaged getting sleeper logs have been knocked off, but there are a few men out squaring. It is estimated that there are over 20,000 logs in the bush, and it is owing to the fact that the teams cannot cart that log-getting has been suspended. Cardwell road, he says, is also very bad in places.

Poultry.

HATCHING—THE NATURAL METHOD.

By M. FERN.

Selecting Eggs for Hatching.—In selecting eggs for hatching, care must be used, and all imperfectly shaped or thin shelled eggs should be rejected, as well as abnormally large or small eggs. They should be gathered daily and carefully stored in as cool a place as possible.

Eggs to be hatched by hens or incubators should be as fresh as possible. Much better results will be obtained if this rule is followed out, particularly in the case of the incubator. Eggs should not be two weeks old at most, and fresher eggs would give better results. Fair hatches have, however, been brought off under hens from three week old eggs.

Eggs, of course, will keep longer in winter than in summer.

When to Hatch.—In Queensland, the hatching season extends from about March to October. In the early part of the hatching season good strong chickens may be hatched from stock that have been well cared for. Hens just through their moult mated to a vigorous cockerel should produce a good percentage of fertile eggs.

The bulk of the hatching is done during August, September, and October. After October hatching no general rule is satisfactory. In particular districts, such as the Darling Downs and Stanthorpe, they can hatch later than the time mentioned. In Central and Northern Queensland, all hatching should be finished by October.

Setting the Hens.—If the natural system of incubation—viz., the hen—is to be used, a nest made of a bottomless box with clean straw placed on the ground should be provided; a shallow hole should be scooped out and covered with straw, on which the eggs are placed. The hen should be placed on the nest at night, and should be well dusted with insect powder; she should be free from scaly leg or vermin in any form. A good plan is to set three or more hens on the same day, in a very quiet place, and when, later on, the eggs are tested after all infertile and possibly broken eggs are removed, the eggs can be replaced under the hen, each having her full quantity, which will probably leave one hen without any. She can be then given a fresh lot. By this means every hen will be likely to have a good percentage of chicks, and no time or space is lost. Cards should be tacked on the box showing the date when set, the number set, the number of infertiles, and the date due; and lastly, the result. If these cards are kept they will furnish interesting and instructive records.

Food for Setters.—The best food for sitting hens is whole corn. They should be taken off the nest daily if they cannot or will not get off. See that they return to their nest. If a number of hens are set together, they should be taken off the nest two at a time, and on these returning, others to be allowed off. This should be done at the same time each day. Cool water, grit, and a dust bath should be provided for each hen. If a hen is particularly wild or restless, she should be taken off and fed late in the evening. All the hens should be powdered once or twice during the sitting.

Testing the Eggs.—Eggs should be tested on the fifth day for fertility. This can be done by holding the egg up to a strong light, when the chick can be plainly seen if the egg is fertile. If infertile, the egg will show a clear pink colour all over, and must be rejected. A good tester can be made out of a piece of cardboard. Cut a hole a little smaller than an egg, place the egg against the hole and hold in front of a strong light. Then the small body with blood veins spreading all around the egg will be plainly visible. A good tester can be made out of a bicycle lamp by tying a piece of dark cloth across the glass and cutting a small hole in the cloth. The egg is then held up to the hole. Testing should be done in a dark room.

Moisture.—If the weather is very dry, and hot westerly winds prevail, the eggs may be sprinkled, but, as a general rule, it is not necessary.

Chilled Eggs.—If, after the first week, a hen should leave the nest for any length of time and the eggs become chilled, the attendant need not give up hope. Another hen should be found to place the eggs under, and even if the eggs have been left for a day and gone stone cold, a fair hatch may be still brought off. There is enough life in the eggs after the first week to stand a lot of chilling in ordinary weather. By this it is not intended to permit carelessness on the part of the breeder, but only to point out to the beginner that he need not destroy eggs that have been deserted for a reasonable time.

When Hatching.—When the chickens begin to chip the egg, it is generally a safe rule to leave the hen to herself; don't go fussing and counting the chickens, unless the hen is a particularly restless one, or in the case of the chickens being overdue—she will do much better if left alone. If some of the eggs seem to be behind time, remove the chickens that have hatched, place them under another hen, and allow the late eggs a chance of hatching.

A NEW HYBRID TEA ROSE—QUEEN OF SPAIN.

The English "Garden" says that undoubtedly the rose of the year is Queen of Spain, and that it must be gratifying to British rosarians that such a superb rose should have been raised in Great Britain and bear the name of one of England's royal daughters.

Messrs. S. Bide and Sons, of Farnham, the fortunate raisers, are to be congratulated upon this, their first introduction among roses, and as they have begun so well it is to be hoped they will continue to add to the collection roses of equal merit. Many who saw the variety when first staged at the National Rose Show thought it deserved a gold medal, and so it did. Queen of Spain was raised from Antoine Rivoire crossed with another variety. The colour is pale flesh with a darker centre, the tint being much intensified upon plants one year old. It possesses the valuable quality of erect stems, so that the handsome flowers are borne well above the foliage, a trait it inherits from its maternal parent.

Exhibitors have been wanting a rose of this type for some time, for it is freely conceded that there has not appeared for some years a finer rose as regards form. We shall not be surprised to find that Queen of Spain will soon take a position near the top of the list of exhibition roses. It has specially good lasting powers, a fact fully demonstrated by the freshness of the blooms at the end of the two days' show at Holland House. No one can deny that fully three-fourths of the novelties introduced at the present day are of a very flimsy character, although charming in colour, and, as garden roses, they are excellent, but there is room for many more of the type of beauty of the rose illustrated.

The Orchard.

STRAWBERRY-GROWING.

At a meeting last month of the Wellington Point A. H. and I. Association Mr. Wm. French read the following instructive paper on strawberry-growing:—

HISTORY OF THE STRAWBERRY.

The strawberry, a genus of low perennial stemless herbs, with runners and leaves divided into three leaflets, calyx open and flat, petals five, white; stamens ten to twenty, sometimes more, pistils numerous, crowded upon a cone-like head in the centre of the flower, seeds naked on the surface of an enlarged pulpy receptacle called the fruit. The strawberry belongs to the great rose family, and the name of the genus is Fragaria, from the Latin *Fraga*, its ancient name—*Fragaria vesca*, the wild strawberry of Europe, *Fragaria californica*, found growing on the mountains of California, *Fragaria chiliensis*, found growing wild, from Chili and other South American countries (this species is the parent of the noted European varieties), and *Fragaria indica*, a small yellow-flowered and tasteless fruit. Therefore, by cross-breeding and fertilisation of those wild—you might call them weeds of plants—have been raised to thousands of varieties, and to-day rank in one of the leading first-class fruits of the day, which, I believe, can still be greatly improved in the way of size, flavour, and productiveness, and instead of giving us a harvest of six months' picking, they can be brought to eight or nine months. Taking into consideration the small plants and the amount of fruit they produce, I consider them a marvel. But much always wants more. How the name of strawberry came to be applied to the fruit is unknown. Some say it was because the children used to string them upon straws to sell; others because straw being used around the plants to keep the fruit clean. There is nothing conclusive on this point. The strawberry does not appear to have been cultivated by the ancients, or even the Romans; it is only within this last hundred years there has been any improvement in the varieties in cultivation.

SOIL AND ITS PREPARATION.

The main point to be observed is to secure a good depth of soil, with good drainage and plenty of nutriment for the plants. If new soil, give two or three ploughings, about 4 inches for the first time; allow to lie exposed to all weathers for a month or two, then give a good cross-harrowing to thoroughly break and pulverise the furrows. Roll and harrow until well clean and fined down, then give a second ploughing—nothing less than 8 or 9 inches deeper. If possible, let it lie for a few weeks to allow the atmosphere to mellow and play its part, which is no small item, taking the advantage to harrow after a shower. Roll and harrow until properly pulverised. This is, I consider, the foundation and most particular point in strawberry-growing—to watch and have the soil under proper tilth, so that the roots of these small plants can lay hold of the soil at once after they are planted. If left rough and lumpy, the roots cannot do so. After a few days of wind and sun the young roots are parched, and just linger between life and death, and also show the effect of every little spell of dry weather during the season. There is also that aggravating work of filling up misses, which I consider is very disheartening, and occasions loss of time and plants. New, broken-up soil is greatly improved by growing a green crop of, say, oats and rye, or cow-pea. If not required for feed, it is better still to plough this in as a green manure.

Preparing Ground for Planting.

My way is to draw a drill out with the plough as deeply as you can, about 3 feet apart; put your manure in the trench. If artificial, I prefer to draw a long-toothed rake up the furrow to mix the manure with the soil; if farmyard manure it is not required. Then run the planet junior between the drills to cover in the manure, and get the ground as level as possible. If this is done after heavy rains you will find the plants in the hollow with their crowns buried, which is a great hindrance to their growth. I have seen them stand for weeks without making a start.

Manures.

The strawberry is a plant that will not refuse a good amount of manure, providing it is presented to it in a proper way. I find by experience that the plants make a start into growth very much quicker, and are well established before the winter, where I used the farmyard manure. My experience with the Annette has been that in every case where I used this manure I always got the best results. But I am sorry to say it is in too limited a quantity. The principal manure I use to plant upon is bone dust, at the rate of about 10 cwt. to the acre. I find by putting the manure well down below the surface it greatly encourages the roots to strike down, and the lower they get down the more moisture they obtain, and the less they are affected by the heat and drought. After the first crop of fruit is gathered, I mix my own fertilisers, consisting of superphosphate, sulphate of potash, sulphate of ammonia, at the following rate:—2 parts superphosphate, 2 parts sulphate of potash, 1 part sulphate of ammonia. Be sure to break all lumps so as to have it well mixed, as this is important. I got a small hand plough, made by Mr. R. Lang, our local blacksmith, which works admirably, and only takes one-quarter the time as with the hand. I run down one side of the row, and make a small furrow, about 2 inches deep, then sow the fertiliser in, and, by running the reverse way back, it covers the fertiliser over, and leaves it quite level.

Planting Strawberries.

As it is impossible to fix a hard-and-fast time to transplant, as the seasons differ so much, I shall have to leave it to one's own judgment. But my experience teaches me that the happy medium is the best—not too early or yet not too late. If too early, and a few of those scorching February days comes upon them, you are apt to lose 50 per cent. I have been the most successful with plants put out in March. I also prefer the runners. Some growers say they get the best results from old crown split up. That is not the case with me, as they take longer to start growth, and that is a disadvantage. I plant 3 feet between the rows, and from 1 foot to 18 inches in the row, to allow the horse and scuffle to go between the rows, so as to keep the soil always open and free—which I consider of great importance. In transplanting, some recommend shortening the roots by one-half. This practice may be all right in cooler countries where the ground is, practically speaking, always moist and cold below. It may also be good in cases where the roots are allowed to get dry or injured in any way—then a clean cut would, in my opinion, be beneficial. My advice is never to let the roots get dry if it can possibly be avoided. If the day is hot and dry, have a little water in the tin you are carrying your plants in when planting.

My method of planting is to allow the roots to hang straight down in the hole—the deeper the better, on account of the roots keeping cool and moist, providing the crown is not smothered. Some cultivators use a dibble for planting, making a round hole in the soil, and thrust the roots in a clump; others just scratch a handful of soil off the surface and plaster it back on the roots, the roots lying in a horizontal position instead of being perpendicular in the hole. Plants might live under such treatment, providing we had showers every day, but careful planting with a trowel is much the best.

VARIETIES THAT DO BEST WITH ME.

Aurie (seedling).—Fruited ready for market three weeks ahead of any other variety, including its parent; large, good colour, flavour good, also a good one for carrying. The first crop is a large berry, the middle one small, the last large and robust plants; no disease.

Glenfield Beauty.—Splendid, both for box and factory, provided they are allowed to ripen properly; a robust grower, ripening in June; very prolific; prefers plenty of moisture, for it does well in a wet season, yet will stand heat waves and drought.

Trollop's Victoria.—An old favourite; rather late compared with the more recently raised varieties, producing good box fruit; also good for factory. My experience is, that it is a shy bearer in a wet season. The growers don't seem to have any success with it up the North Coast line, where experienced men have given good trials.

The Anetta (previously known under the raiser's name, Butts's Seedling, of Montville), which I consider is a great acquisition to the long list of seedlings. It is rather erratic; some seasons it does splendidly, others the reverse. Last year it was very unsatisfactory with me. This season it has done splendidly. I cannot put it down to the season altogether, because it acted the reverse with others in the district. I am inclined to plant out freely this season, and give it a further trial.

Marguerite.—Good for the first of the season, but after getting a good first crop it cannot be depended upon for the remainder of the season.

Federator is a variety like the Glenfield Beauty; it produces splendid crops in a moist season, but stands the heat and drought badly. It, therefore, as a rule, gives a short season.

Pink's Prolific.—Good for a private garden, but too late to plant a large area.

Noble.—Good for an early variety, producing a splendid, large, and good-coloured berry, but a shy cropper after the first of the season. Several seedlings are under observation, but not advanced enough for distribution.

PROFITS OF STRAWBERRY CULTIVATION.

Persons who have had no experience in raising strawberries for market are desirous of ascertaining in advance the prospects of profits on investments. Unfortunately for the would-be investor, results depend greatly upon circumstances, such as markets within reasonable distances, plenty of labour at moderate rates where needed, cheap lands and fertilisers, also favourable seasons. The greatest profits in cultivating the strawberry are made by small growers within a moderate distance of the cities who have children to assist in gathering the fruit when needed. An acre of strawberries under high cultivation, with the fruit gathered and marketed in the very best condition, will often yield more clear profit to the grower than 10 acres under opposite conditions.

The lecture was very much appreciated, and Mr. James Pink, president of the association, who is an expert himself in strawberry culture, gave some information on the early history of the berry in Queensland which is not generally known. The first strawberries, he said, came from Gympie in 1881. This is, however, not exactly correct, as the first strawberry plants were imported from Sydney by Messrs. A. J. Boyd and Fleay, who grew them on their orangery at Oxley in 1866, and Mr. L. A. Bernays tested the fruit in that year.

In 1884 Mr. Peel, of Cleveland, raised strawberries—the first sold in Brisbane. Then followed Mr. Thompson, who had a garden in South Brisbane, opposite the Regatta Hotel. The first strawberry judges at the National Agricultural Show were Messrs. L. A. Bernays, Jas. Pink, and Charles Baldwin. These judges, however, refused to award a prize, because the exhibitor would not allow them to taste the fruit.

PINEAPPLE MANURING EXPERIMENTS.

In our issue of January of this year we drew attention to some experiments which were being made by Mr. A. H. Benson, Instructor in Fruit Culture, with a view to ascertaining the best method of applying manure to the plants, and also the best kind of manures to use. We have now received Mr. Benson's progress report on the results so far attained on four farms, at Clayfield, Nundah, and Nudgee, which will doubtless prove of much interest to pineapple growers all over the State.

Progress Report.

Mrs. Stuckey's Garden, Clayfield.—I inspected this plot on Wednesday, 27th February, and found it in excellent order. The plants—rough—which were a mixed lot from the same garden, have taken well, and have made an excellent growth. Though too soon to form any definite opinion as to the action of the different manures, there is already a marked difference in the manured and unmanured plots. Those plots that have been manured with a complete manure—viz., one containing potash, nitrogen, and phosphoric acid—look the best, their leaf growth being stronger and colour better than those to which incomplete manures were applied.

This is especially noticeable in the case of the plot manured with potash and phosphoric acid and no nitrogen, and in the case of the plot manured with bone dust only, as both of these plots are backward, and little, if any, better than the unmanured plot.

A trial in planting was also interesting. Two rows, side by side, were manured with the same complete manure; in one the plants were not trimmed prior to planting, and in the other they were trimmed back in the usual manner. The untrimmed plants have done the best.

Mr. Gollocher, Nundah.—Inspected same day. Weeds have made good headway during wet weather, but are being cut out. The plants—smooth—are, taken as a whole, doing well, though some of them were not too good when planted, and are consequently hanging a bit. As at Mrs. Stuckey's, the complete manures have a decided advantage, and the unmanured plot is poor. Lack of nitrogen is also clearly shown. The pines are rooting deeply, the thorough working of the soil prior to planting having a decidedly good effect in this respect. A good root system is very important, as not only does it prevent the plants from falling over, but it enables the mother plant to throw out good ratoons.

Mr. Corbett, Nundah.—Inspected same day. Ground in excellent condition and showing no signs of the heavy rainfall of a few days previously, the thorough working of the land prior to planting having provided good drainage, and, consequently, a good get-away for the water. The plants, smooth, have made a very good start, and are well and deeply rooted. Good strong suckers have made at least 18 inches of entirely new growth since they were planted, in the first week of December, and the stumps planted are throwing out strong, healthy suckers of good colour. As at the previous places, the complete manures show up much the best, and the manure containing no nitrogen has not had much effect up till now.

The general results of the experiments tend to show:—

1st.—That the thorough preparation of the land prior to planting is essential.

2nd.—That such preparation of the land improves its drainage and encourages the plants to root deeply.

3rd.—That pineapple plants can stand a very heavy dressing of manure, thoroughly mixed with the soil, prior to planting without injury.

4th.—That complete manures, containing at the rate of 150 lb. of K_2O (pure potash), 75 lb. of N_1 (nitrogen), and 75 lb. of P_2O_5 (phosphoric acid) to the acre are showing the best results.

5th.—The bone dust by itself, applied at the rate of 1,000 lb. to the acre, shows no result so far. This is to a certain extent to be expected, as it is a slowly-acting manure.

6th.—That the presence of nitrogen in the manure is of vital importance in the early stages of the plant's life, as, where absent, the plants are decidedly poor.

MR. J. ATTHOW, Nudgee.—Inspected 28th February. This experiment is a continuation of one of the previous series. The plants which were set out last autumn made no growth whatever for months, but are now getting a good hold of the ground. A heavy growth of cowpeas has been made between the rows of pines, and this, in my opinion, has to a certain extent retarded the growth of the pineapple plants, as it has had a tendency to shade the ground too much, and, consequently, to keep it too cool. The ground will now be thoroughly cleaned, and the cowpea plants be allowed to rot down, when they will be dug in. I expect to see a marked improvement in this plot shortly, and will give it a further manuring in July next.

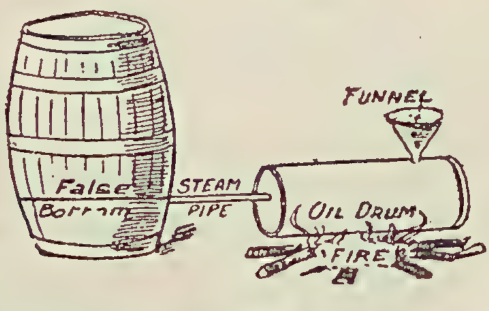
At Mr. Atthow's, I examined the pineapple suckers obtained from Mr. J. Paske, Tinana, Maryborough. They have borne their first crop of fruit this season, and it has been of exceptional quality and size, the fruit I saw averaging at least 4 lb. each. This is very satisfactory, as the introduction of this new variety should be of considerable benefit to the district.

ALBERT H. BENSON.

FODDER-STEAMING APPLIANCE.

A correspondent sends to "Garden and Field" the following diagram and description of an appliance for steaming fodder, which commends itself to us as being at once cheap, simple, and effective. He says:—

The following contrivance for steaming chaff and other fodders for cows or pigs will be found very effective:—A five-gallon oil drum on its side on the



ground, with small excavation underneath for fire, and a few stones built round the drum to hold it in position. A pipe is carried from the drum into the barrel. A false bottom in the barrel is required, with holes to distribute the steam. The funnel shown on the oil drum is for filling with water, and a plug is required when the funnel is removed. This contrivance cooks mangels and other roots well, and should be just the thing for a small farm or dairy.—Yours, &c., J. G.

Tropical Industries.

COTTON-GROWING.

By DANIEL JONES, Department of Agriculture.

The Value of Trap Crops.

The most formidable pest thus far known affecting cotton cultivation in Queensland, has been the cotton boll worm, or caterpillar. This insect, in our early experience, dating back some forty years, was responsible for considerable losses of this valuable product. In those days farmers were very inexperienced in coping with or exterminating the evil. Some of the suggestions then made were not only highly unpractical, but many savoured so much of the comical element that I refrain from noting them. Since those days, the improved system of treatment of this crop has made considerable strides. Thus, to-day, our study of American methods of crop treatment, relating principally to the destruction of insect and fungus troubles, offers to us a more practical and safe method of coping with these evils.

The careful experiments carried on under the supervision of the several State entomologists connected with the various colleges throughout the cotton belt of the United States of America furnish the Queensland cotton-grower with abundant information relating to the proper cultivation of his cotton plantation. Our observations on this point in the cotton fields of this State confirm the findings of the American planters in regard to the value of trap crops as a means of diverting the attention of boll worms and borers towards maize, kaffir corn, and other forms of vegetation.

I ascribe the very severe losses due to boll worm in our cotton fields in the sixties to the fact that in those days, in our cotton-growing districts, the planters, owing to the high price of fibre, placed their lands under cotton exclusively. Thus, in the absence of maize, sorghums, &c., the boll worm of necessity attacked the only available food, to the great detriment of the planter.*

This phase of the question was brought prominently under my notice during my recent visit to the western cotton areas. At no place where mixed farming was carried on, did I find evidence of boll worm depredation to any serious extent, and, for the most part, the plots were practically immune. In one instance, however, I found the caterpillar doing some considerable injury by boring into the pods in numbers. This plot of about 4 acres of Upland cotton was located in a belt of forest country isolated from all other crops, none being nearer than from 1½ to 2 miles.

From our local experience, it now appears to be a well-established fact that the presence of vegetation such as here recommended has a very beneficial effect in the protection of the cotton crops. I am reminded here also that in the experiments carried on for some years at the Agricultural College, Gatton, the boll worm has done little if any injury to the cotton plots growing at that institution.

This, in my judgment, is attributable to the fact that, at the time cotton is maturing, there are numerous crops growing in all stages of development, which have a greater attraction for the moth of the cotton boll worm, and hence the cotton plots are avoided by this insect.

The authorities quoted in the several extracts, which will be printed in the Journal, from very copious references to this important subject, by the

* In the Oxley District, where large areas of maize were grown in the early days, the ootten suffered little or no injury from the boll worm.—Ed. "Q.A.J."

various American entomologists, should be of very great practical benefit to our present and prospective planters in Queensland. While recently inspecting an area of some 6 acres of Sea Island cotton, at Redbank Plains, the property of Messrs. Kitchen and Sons, where an experiment of this nature is being carried on with maize and kaffir corn, I found on one maize stalk and ear which I examined no less than twenty healthy caterpillars, fifteen of which were full-grown insects of the boll worm type, and the remainder, borers, evidently of another species.

The kaffir corn was also affected by caterpillars, though they were not much in evidence. This I attribute to the presence of numbers of soldier birds, who appeared to be successful in finding the trap crops a prolific and easily accessible source of food supply.

In connection with the general topic of cotton cultivation, although the subject is not on lines of the previous matter, I wish to emphasise the idea that among many of our growers there is an opinion that cotton is so delicate a fibre that it will not stand the stress of wet weather or any undue exposure. This fear has so embarrassed growers that they have in many instances discarded good cotton on account of a slight discolouration, and this often compels the planter to start his pickers in the field working more towards finding cotton than picking it.

There is no need to start pickers going until the pods are well out and in sufficient quantity to permit the picker earning a fair wage.

It is simply waste of time for the pickers to go rambling over the whole field gathering a few pods here and there. This adds considerably to the cost of picking, as well as rendering the operations monotonous, and in other respects unsatisfactory. These remarks apply more particularly to our hardy Upland types. However, for our more delicate and valuable staples of the Sea Island varieties, the closer the areas are kept free of matured cotton the better, as on the care in gathering free from *débris* and stains, will the value of this variety be appraised in the British market. There is so much misunderstanding on this subject that I make special mention of it here. Only last week a writer in one of our leading dailies very erroneously broached the subject in this way: "That cotton required gathering daily for fear of the consequences of exposure to weather." This, added to other similar misrepresentations as regards labour and picking, has done more than anything else in disheartening prospective growers; and has also been the means of thwarting the most earnest efforts of those most familiar with the question, in establishing what in the near future will become one of our leading agricultural industries. In submitting the following reports from American authorities, I hope the Queensland growers this coming season will give the subject the intelligent trial the system certainly deserves.

TRAP CROPS.

BY A. L. QUAINTANCE AND F. C. BISHOPP,

Bureau of Entomology, United States Department of Agriculture.

Attention has been elsewhere called to the decided preference of boll worms for corn as compared with other plants upon which it is known to feed. This preference permits of the use of corn in a way calculated to protect cotton from injury.

The corn should be planted in belts through the cotton field at a time that will result in its being in tassel and silk about the 1st of August. By this time moths are developing from larvæ, matured in the roasting ears of neighbouring corn, which has now began to ripen and is no longer attractive to the moths for egg-laying purposes. In the natural course of event, the moths migrate to cotton fields, where they deposit the bulk of their eggs.

Finding these belts of corn in tassel and silk, however, they deposit on them the greater part of their eggs, and correspondingly neglect the cotton plants. The September generation of larvæ is sometimes a source of considerable injury, especially to very late cotton. Corn may easily be brought into silk so as to attract moths of this generation by planting only a portion of the belts through the cotton fields at the time of first planting, and then completing the work two or three weeks later. The same results may be secured by planting patches of corn here and there over the plantation, following crops of oats, wheat, or Irish potatoes. Cowpeas are very attractive to the boll worm moths, owing to their fondness for the nectar profusely secreted by this plant. Thus the corn trap rows may be made more effective by planting rows of peas alternately with rows of corn. The peas should come into full bloom at the time the corn is silking. This will necessitate planting the peas about the time the corn appears above the ground. The advantage gained by the use of trap crops cannot be expressed in pounds of seed cotton, as it is impossible to arrange a test so that the area left for comparison will be subjected to the same conditions without having it adjacent, and, consequently, equally subject to protection by the corn. Boll worm moths fly freely, and are therefore attracted to fresh corn from a considerable distance, and the influence of the trap rows is thus quite general.

During 1903, tests of corn trap crops for protecting cotton against the more destructive August generation of boll worms were made at Calvert and Wills Point, Tex. Early in August the number of eggs upon eight typical plants in the trap rows at Wills Point was found to be, on an average, 495 per plant, 804 eggs being the maximum number found on a single plant; no account was taken of eggs deposited on plants previous to or succeeding this time. From these figures some idea may be gained of the vast number of eggs which are thus diverted from cotton. In 1904, tests of corn as a trap crop were made at Sulphur Springs, Quinlan; and Hetty, Tex.; and at Shreveport, La. The same general plan was carried out in all of the above localities, protection from the August brood only being sought. Belts from 10 to 40 feet wide, extending across the field, were left unplanted at the time of planting cotton, and these were seeded to Mexican June corn by 1st June, in rows from 5 to 6 feet apart. Ten days later cowpeas were planted between the rows of corn, thus leaving ample room for cultivation. The corn was planted in about the proportion of ten rows to forty rows of cotton, and the individual fields varied from 20 to 40 acres.

The following table, computed from counts made of the number of eggs on twenty typical plants in trap rows on the farm of Mr. J. T. Hargrove, Sulphur Springs, Tex., will give an idea of the number of eggs kept from the cotton by a few acres of trap corn. The figures show the average number of eggs for each plant, and the average number on the various portions of the plants:—

Table VII.—Distribution and Average Number of Boll Worm Eggs on Corn.

Date of Examination.	Number of Eggs on—		Sheaths.	Condition of Corn.	
	Entire Plant.	Leaves.		Tassels.	Silk.
28th July	338·4	88·85	55·55	64·93	129·1
16th August	52·55	12·	7·85	10·8	21·9

Many plants not in silk corn in roasting ear; silks drying.

During a year of greater boll worm abundance, the number of eggs that would be deposited on corn would doubtless far exceed the numbers here given. The number of eggs occurring on an acre of trap corn at one time, as based on the above figures, is surprisingly great.

Taking the average number of eggs per plant on 28th July, as given in the table, the protection afforded by the plants on a single acre may be calculated in a theoretical way. Assuming the corn rows to be 6 feet apart and the plants $1\frac{1}{2}$ feet apart in the row, there would be on an acre 4,840 plants. On the average of 3,384 eggs per plant, as found above, there would be 1,637,856 eggs distributed over the acre of corn. By a series of observations, it has been determined that a single boll worm feeding freely on cotton will destroy on an average eight squares, one flower, and one and two-thirds bolls during the course of its growth. Assuming that all of the fruit destroyed would have eventually matured, there would be a total destruction of 17,470,464 bolls. On an average of seventy bolls to the pound of seed cotton, this would mean a destruction of 249,578 lb. of cotton in the seed, or at the rate of 1,500 lb. seed cotton to the bale, 166 bales.

It must be remembered, however, that in the above calculations it was assumed that from every egg a mature larva would develop. This would be far from the case in reality. In fact, it has been observed that on an average but one larva reaches maturity from about fifty eggs deposited on corn. It was further assumed that all of the squares and flowers injured would have otherwise reached maturity, which in fact would not be the case, as many squares and young bolls are shed by the plants on account of unfavourable weather or other conditions. However, after making due allowance for all of these conditions, the benefits to be derived from a proper use of corn as a trap crop are seen to be very great.

It might appear at first sight that the practice of furnishing the boll worm with an abundance of its preferred food would simply result in its greater increase and consequent destructiveness. This, however, does not result, for when the eggs are concentrated on the corn plants as on the silks they are very largely destroyed by a certain parasite and by predaceous enemies, and the larvæ hatching from these eggs are largely killed by the cannibalistic habits of the boll worms themselves. Out of some fifteen to thirty young larvæ, which may usually be found in a recently silked ear of corn, but one or two boll worms will eventually reach maturity.

Numerous instances have come under the observation of the writers where planters in attempting to make use of trap crops have made the mistake of planting the corn at the usual time in the spring. The result has been that the cotton has suffered greater injury than would otherwise have occurred. The success of the trap crop idea as here considered depends entirely on having the corn in tassel and silk on or about the 1st of August, and it must be planted considerably later than the normal time of planting corn in spring. June corn planted the last of May or 1st of June, with good cultivation, will be silking and tasseling freely by 1st August.

The greatest benefit will come from the use of corn as a trap crop in its general adoption by the planters of a neighbourhood. In the case of large plantations, it is quite possible to adopt a system of growing late corn, after oats, wheat, or early maturing crops, which will attract the boll worms from the plantations generally. An instance of this practice may be cited on the plantation of Mr. F. L. Maxwell, of Mound, La. It has been the practice of this gentleman to grow small areas of late corn after oats here and there over the plantation, to the almost complete protection of his large cotton crop.

QUEENSLAND COTTON.

Last week (says the London correspondent of the "Courier") I referred to the fact that an expert opinion was being obtained on the cotton sent to this country by Mr. Jones, of the Agricultural Department. Six samples in all were received, four of which have been reported upon by Mr. J. A.

R. Clarke, late manager of the Madras Cotton-cleaning Company, who is on the point of leaving England to manage a new cotton syndicate in India. His report is of a most encouraging character. Judging by these samples, he is satisfied that cotton-growing could be carried on profitably by the small farmer in Queensland. He was particularly impressed with one sample, consisting of fine long staple and silky cotton, which he values at 1s. 1d. per lb. Another, short and rough, he values at 7d.; a third, or short staple, at 6d.; and the fourth, a rough kind and short staple, at 5d. It has not escaped notice in England that Dr. Thomatis has produced in Queensland, from 1 acre, 1,200 lb. of clean lint of the Caravonica kind, which has been selling at 10d. per lb. If only 20 acres were cultivated, and the price realised was 6d. per lb., this would give the farmer £600 to the acre. The British Cotton-growers' Association has just granted £10,000 for the encouragement of cotton-growing in India.—" Bowen Independent."

THE COTTON MARKET.

The following were the prices for cotton in London on 5th January, according to Messrs. Slann and Davies:—

—	Good Fair.	Good.	Fine.	Super-fine.	COMPARE Good 1906.	COMPARE Good 1905.	—
	d. d.	d. d.	d. d.	d.	d. d.	d. d.	per lb.
Surat kinds	$4\frac{3}{8}$ to $4\frac{21}{32}$	$4\frac{5}{8}$ to $5\frac{7}{16}$	$4\frac{7}{8}$ to $5\frac{3}{4}$	...	$4\frac{11}{16}$ to $5\frac{5}{16}$	$3\frac{7}{16}$ to 4	...
Madras	$4\frac{15}{16}$ to $5\frac{1}{4}$	$4\frac{15}{16}$ to $5\frac{9}{16}$	...	...	$4\frac{13}{16}$ to $5\frac{7}{16}$	$3\frac{15}{16}$ to $4\frac{1}{16}$	...
Bengal	$3\frac{9}{16}$	$3\frac{13}{16}$	$4\frac{1}{16}$	$4\frac{7}{32}$	$3\frac{15}{16}$	$3\frac{13}{32}$	...
Assam, &c.	...	$5\frac{1}{4}$	6	$6\frac{3}{4}$	...	...	...
China	...	$4\frac{15}{16}$	$5\frac{1}{2}$	6	5	$4\frac{3}{8}$	...
West Indian	$5\frac{3}{4}$	$6\frac{1}{4}$	$6\frac{3}{4}$	7	$6\frac{3}{8}$	$4\frac{1}{2}$	...
Sea Island	$7\frac{1}{2}$	$9\frac{1}{2}$	$14\frac{1}{2}$	16	$9\frac{1}{8}$	$8\frac{3}{4}$	...
Australia	$6\frac{1}{2}$	$6\frac{3}{4}$	...	...	$6\frac{3}{8}$	$3\frac{15}{16}$	...

The trade demand has been good, and spinners have " called" freely during the past week; American deliveries are 8 points for near and 3 for distant, and the spot price 14 points above the previous week's close. Sales amount to about 7,000 bales. East India is rather firmer, but there is not much business passing.

The latest quotations of Americans for delivery, basis middling, any port, G.O.C., were:—

	10th Jan.		Last week.		Last year.
January	5.64½d.	...	5.56½d.	...	6.01d.
January-February ...	5.64d.	...	5.55½d.	...	6.01d.
February-March	5.62d.	...	5.54d.	...	6.04d.

CONSUMPTION OF COTTON IN GREAT BRITAIN.

—	1906.	1905.	1904.	1903.	1902.
American	3,106,271	3,086,308	2,408,364	2,584,884	2,718,385
Brazil	220,518	98,825	96,224	131,818	201,511
Egyptian	395,295	393,581	393,913	334,492	350,980
Peruvian, &c.	90,587	71,943	53,072	38,909	51,617
East India, &c.	79,724	48,075	125,158	83,662	18,831
	3,892,395	3,698,732	3,076,731	3,173,765	3,341,324

The cotton-seed market has been very firm, and dearer, with a good business doing for near contracts. Business done includes: Egyptian, £6 15s.

to £6 15s. 3d. spot, and £6 17s. 6d. for January-March. Crude cotton-seed oil is reported strong at 12s. 6d. to 15s. advance, say, £22 15s. for spot, and £23 for May-August delivery. Refined at £24 to £25.

It will be noticed that Sea Island cotton is here quoted as high as 16d. per lb. The "Agricultural News" of Barbados gives the various quotations as above, but states that the prices actually paid for Sea Island were 7¾d. to 13½d., showing that there are no shipments of fine and superfine on the market. Caravonica cotton is not mentioned, although we have been given to understand that several bales have been sold in London at 10d. per lb. The following paragraph on Dr. Thomatis's Caravonica cotton is from "Tropical Life":—

A GOLD MEDAL FOR CARAVONICA COTTON.

Dr. David Thomatis informs us that, although the silver medal awarded for his Caravonica cotton at the Tourcoing (France) International Exhibition was the highest distinction allotted for raw cotton, yet the grand jury saw fit to increase the award to a special gold medal. We are further told that an American is negotiating with Dr. Thomatis with the idea of obtaining complete control over the monopoly of this class of cotton, and also of the seed, for a period of ten years. By means of this deal, if carried out, it is hoped that the variety will be grown exclusively in America. We doubt, however, whether this can be carried out successfully, as many of our subscribers have obtained supplies of the seed for African and other centres, and this alone should extend its cultivation over a considerable area outside the United States.

COTTON-GROWING IN THE CENTRAL DISTRICT.

The "Rockhampton Morning Bulletin" has the following letter, addressed to the secretary of the Charters Towers Planters' Association by Mr. G. Sanderson, of Glen Lamond, Stanwell, whom our readers will remember as an enthusiastic and very successful pioneer cotton-grower in the Central district:—

Your letter received. You write very hopefully of the trial of cotton culture around you. Fancy that crop which you mentioned as being spoilt with flood water will have recovered by this time if it was not too closely planted. The effect of such rain—5 inches—is nothing here if dry weather follows. I must admit that the crop may grow to wood after such rain. My crop is this year largely a pruned crop. There is much to be said about it when compared with a seed crop. If interesting to your growers, I will write fully. I fear your want of a gin will damp the ardour; my gin is working now while I write. The field is only sixty yards away, so all is compact. I have four pickers—boys about fourteen years of age, from Rockhampton. They get 1s. for 20 lb., weighed every night and deposited alongside of the gin. Thirty cows to be milked in the morning. The gin started after dinner; it is 7 feet above the floor, and the lint falls into the suspended sack—wool sack. The seed drops also into suspended sacks. Altogether small, but very compact and labour-saving. I would like to know what Kitchen and Sons or others offer your people for cotton in seed. As to cost of picking, I paid two boys £1 6s. for nine days' picking for the last fortnight. For nine days' work, four pickers made £2 18s. 5d.; but there is 5s. to be added to this sum for 100 lb. that was too wet to be weighed, and will come in this fortnight. Lads I have would have been idle in Rockhampton, now getting good money and valuable information; also a wage spreading national crop is wanted, having no bounds in respect to market. I give you these details so your people may compare. I can understand how Mr. Benjamin and such men take interest. The future is indeed dark if something is not done to establish confidence in some national crop. I have no intention of wasting another hour over any of the valuable cotton, Sea Island or hybrids. After a

lot of observation I say the hybrids are all dangerous; they go back one way or the other, and lose their special character. I follow and agree with American experience. A good, strong, long silky Uplands is my choice. I am collecting all my Texas King, and much inclined to make it my choice. Russell Big Boll is a cheap, short cotton compared; they are both standard Uplands.

COTTON-PLANTING AND COOLIE LABOUR IN CEYLON.

We take the following interesting extracts on the work of an experiment station in the north of Ceylon (Kanadara-oya) from a circular on cotton issued by the directors of the Royal Botanic Gardens, Ceylon. Mr. C. J. C. Mee, superintendent of the experiment station at Mahailuppalama, tells of his troubles with the coolies, troubles which will cause the Southern and Central Queensland cotton-grower to rejoice that cotton in these districts can be profitably grown without dependence on such broken reeds as are apparently these North Ceylon coolies:—

"We got a crop somewhat similar to that obtained in Southern India, the total yield of 5 acres being 289 lb. of lint and 849 lb. of seed. The monetary value of this crop was about 75 rupees, less the considerable cost of transporting it to Colombo and getting it baled. . . . . Nobody could put coolie labour into it and make it pay. Even a coolie for every 5 acres would cost 18 rupees an acre, and the picking, at a cent a lb., would come to another rupee, besides the cost of ginning and baling. . . .

CLEARING THE LAND.

The jungle covering the bulk of the land was very heavy, and consisted of large palu trees, satinwood, stunted and worthless ebony, huriyi, kihiriya (both very hard and useful), kon, diwul or wood apple, ahala, mi, and others. All these are very hard to cut, and are surrounded by a dense undergrowth of thorn, and all bound together by enormous creepers. The thorn is very poisonous, and I lost the services of many coolies on that account, bad festering sores and great pain being the result. There is also near the elas a certain amount of halmilla, magnificent kumbuks (a very useful and durable wood), and a large tree, the timbiri.

I append a statement of expenditure, the largest item being the one for clearing the ground. It is out of proportion to the value of the work done, but was unavoidable. The question of labour was very serious, the ruling rates being 50 cents for men and 35 for women. The railway and irrigation works and the Public Works Department absorbing every available coolie, I was obliged to depend on village labour, much of which was procured from a great distance. Though the health of the villagers has been much improved, and their wants are certainly not very great at the present time, still they are physically very inferior to the low-country Sinhalese. The women are for the most part stout and healthy, but the men emaciated, listless, and malarious, and incapable of either continuous or hard work. Their axes are like the American shingle axes, and they never cut down the large trees in their clearings; fire destroys a certain percentage; others they lop and girdle, leaving time to do the rest. The director's remark at a recent meeting of the Board of Agriculture about their beginning their day at 8 a.m. and finishing it at 2 p.m. is only too true. By dint of worrying I did manage to get them to start work at about 8 o'clock; at 11 they retired into the shade of the jungle to sleep, overcome by the heat. At 2.30 they began in a half-hearted manner to return to work, and continued till 5 or a little later, expressing great fears that they would be sure to meet elephants and bears if kept so late. Expostulation was useless, and losing one's temper merely meant losing one's labour; they absented themselves, and never even returned to claim their money.

Their method of clearing is peculiar. Armed with long vetta-katties, and with their feet protected by large wide sandals made of sambur hide, they cut up and trample the thorn and creepers, and fell all trees up to 9 inches in diameter. In many cases the trees are so bound up with creepers that they cannot fall. They then leave the clearing to dry, which takes a long time, and then on a lucky day they set fire to it. It burns indifferently, and it has to be piled several times. For this they charge Rs. 25 per acre. This is the furthest that the Sinhalese ever go in their own clearings, and is probably really worth about Rs. 12 to Rs. 15 per acre, but I had to pay the rate current in the district. The arduous work then remains to be done, in removing the large trees. I could make no contracts. The only time I ever did so I paid at the rate of 50 cents a tree. The man at pay-day said he was ruined, and never asked for another contract. I was provided with American crosscut saws and axes. In cutting up palu, which exudes a thick glutinous milk-like indiarubber, and also in cutting huriyi and kihiriya the saws had to be constantly sharpened and the milk of the palu scraped off. On the whole, they preferred axes, but complained that they were too heavy. It was then all logged together, in many cases by women, who did good work, and burnt.

The month of April was a very anxious time. No one worked. I at length procured the services of Mr. J. K. Dissanayaka from the village of Kalanchchiya, and things began to improve, and I had a more or less fairly sufficient force for some time. Very few remained continuously; my first contingent left after pay-day, and spent all their pay in restoring a village dagoba and getting whatever necessaries would keep them in secure idleness for the rest of the year; the next lot spent all their money in employing Vattars, a species of Tamils from the coast, who work with an enormous mamoty, the blade of which is parallel to the handle, and resembles an enormous smoothing iron, with which they cut and lift the earth. To such as these they pay Rs. 1·50 to Rs. 2·50 a fathom for repairing their village bunds. Another contingent had a devil-dance, and several weeks of feasting and *bana* preaching and fireworks; they also rested, and have continued to do so. I have, however, collected a mixed force of vagrant Moors, a few Tinnevelli Tamils, and some Kurunegala and low-country Sinhalese, seasoned, to a certain extent, to the climate, and a percentage of neighbouring villages work in harmony with them. The Sinhalese here hate strangers, and keep very much aloof. They say a Tamil is bad, a Moor worse, but a low-country Sinhalese worst of all. However, I work them, when necessary, in separate gangs. . . .

COTTON-PICKING.

The waste of cotton in the fields was very great. I paid for the first and second crop 1 cent per lb. Many villagers picked 45, 50, and 60 lb. a day, but they would only pluck where they could get large quantities, and, as soon as the cotton burst in less profusion they stayed away, or else demanded excessive pay. Even then they hardly attempted to pick; remonstrance was useless. Moreover, as the bushes were very tall, they went from one field to another, mixing the varieties, and the overseer, lost to sight in the cotton, probably never attempted to check them. Fortunately, the Egyptian is a browner variety, and it was possible to separate it to a great extent. Even then, when it had to be spread out and exposed to the sun before placing it in bags, the boy frequently mixed it all up, who had this duty to attend to. The first crop, matured in the latter end of March and first and second weeks of April, total 11,829 lb. gross; the second crop, in the last week of May and month of June, total 6,824 lb.; the third crop was secured in the first and second weeks of September, 2,123 lb. gross. This last crop consisted entirely of Egyptian. After each plucking the bushes presented an exhausted, faded appearance. Within fifteen days they recovered, and appeared quite rejuven-

ated. In each case a period of about thirty days elapsed before starting to pluck again. The third crop took much longer to mature (sixty days). It seemed to hang fire. . . .

The return of lint averaged 130 lb. per acre.

The glaring fault in these cottons was that they were all *mixed.* The fields of Egyptian and Sea Islands were separated only by a belt of jungle 1 chain wide, and as the cotton grew over 6 feet high, it became impossible to watch the coolies every instant. When they were set to pick the Sea Island, the Egyptian happened to be bearing more heavily, and as they were paid by the pound they used to run round into the Egyptian field and pick there.

CARAVONICA COTTON.

The "Cairns Morning Post" says that Dr. Thomatis has received a letter from Mr. W. H. Bemis, Baracoa Plantation, Cuba, stating that trees of Caravonica cotton grew from seed sent by Dr. Thomatis to the height of 7½ feet, with 4 feet of spread, in 44 days, which means 34 days of growth, as 10 days are required for germination. The writer also states that the trees have over 80 blossoms on. Mr. Bemis says that people from all parts of Cuba have come to see the trees, and he adds that it is the "wonder of the island." This phenomenal and luxurious growth in Cuba of the Caravonica cotton is also to be met in Ceylon, where it grew 15 feet in three months, and it may also be here quoted the wonderful size of a Caravonica tree at the back of St. John's Rectory, grown by Archdeacon Campbell, which this year has yielded a crop of over 10 lb. of cotton.

QUEENSLAND FIBRES—A SCOTCH OPINION.

A short time ago the Department of Agriculture and Stock sent to the Edinburgh Roperie and Sailcloth Company, Limited, Leith, a number of samples of fibre prepared by Mr. Boyd, editor of the "Agricultural Journal," and a reply has been received stating that the samples, on the whole, were very nice, and that the sisal hemp was well sold at £35 to £37 10s. per ton. The Mauritius hemp was not quite so good as similar material which sometimes comes from India, where very large areas have been planted with sisal and Mauritius hemp by the tea-planters. The bowstring hemp, retted and treated with oil, was a very nice material; but in valuing it a great deal would depend upon how much treatment the spinner had to give it to bring it to this state of preparation. The sample was worth about £36 per ton, and the treatment with oil had greatly improved it. The machine-cleaned bowstring hemp was not sufficiently well cleaned, and the colour was rather defective. In that state its value was not nearly so high. "We would say that the weak point of all these samples is want of strength, and this point is going to be an increasingly important one in the future. The standard fibre of the textile industry on this side is, of course, Manila hemp, and its features for value are—(1) great strength, (2) sheen or lustre, and (3) cleanliness and straightness of fibre. The latter point seems to be the only one in which other fibres can compete, and, unfortunately for the value of these other fibres, the first two points are extremely important. What everybody is looking for now is a good competitor to Manila in each of the points we have mentioned, but none of your samples fulfil the requirements. These points may improve as time goes on, but with regard to sisal, we would say that finer material is being produced in the Bahamas and in West Africa. In London they obtain at the present time £40 to £41 per ton, but there is not much available."

FURTHER LIGHT ON RAMIE.

By F. DE V.

Of all textile plants the one which furnishes the best fibre, containing at the same time the least gum, is a plant of the Urticaceæ family, named after the German botanist Boehmer, *Boehmeria nivea.*

In its raw state—that is to say, not yet degummed—the fibre goes by the name of China grass, very improperly so, for the plant does not grow exclusively in China, and, moreover, is not a grass. The degummed fibre is called ramie, an article for which there is a constant and increasing demand.

The ramie fibre is one of the finest, most brilliant, and at the same time one of the strongest of vegetable fibres. Its commercial uses are so varied that it is hard to tell where it cannot be employed. It makes the finest gossamer cloth, and the strongest and most durable canvas for sails; combined with linen and cotton it increases their strength and lasting qualities, and as for rope and other coarser products, its merits are too well known to be further mentioned.

Cultivation.—The ramie plant requires as even a climate as possible, and a moist heat; regular rainfall and proper planting at the proper time are vital requirements which must be fulfilled by the planter wishing to obtain fibre of the finest quality; its cultivation resembles that of cotton closely, a steady rainfall when the plants are young, and dry weather when they have matured, being essential.

The best soil is a fine sandy loam, which must be well drained, as stagnant moisture is the ramie plant's worst enemy; it causes the roots to rot, which they do very easily, thus, of course, killing the plant, literally drowning it.

The seasonable parishes in this island are well suited to its cultivation, especially the valley sides, offering ideal sites. Its root system bears a striking resemblance to the strawberry plant—it sends out runners or racemes, which, when strong enough, can be detached from the mother plant and planted out separately.

It is, however, not so much my intention to dwell on the methods of planting and cultivation as on the harvest of the ramie stems, and their subsequent conversion into the China grass of commerce.

The plant is fit for cutting as soon as the flower appears. The stems are 5 to 6 feet high, and the thickness of your finger. The cut and ripped stems are passed through the machine mentioned briefly in the last issue of the Journal (it is called the Aquiles, and is manufactured by R. Boeken and Co., Limited, Dueren, Germany).

The advantages of this machine are—firstly, its low price (£60); secondly, its extreme portability (two men can easily carry it about); thirdly, the low power necessary for its working; and last, but not least, its freedom from delicate parts, easily broken, and hard to replace.

As indicated before, the machine is built on an entirely new principle, the most valuable result of which is, that the long fibres are delivered long, unbroken, and in parallel layers, the three points which, together with the colour, determine the market value of China grass.

I have written far more detailed description of this new machine, which I hope will soon be placed before the readers of the Journal.

After treatment in the machine, the fibres are dried in the bales and shipped.

Before being sent to the looms, they have to be chemically treated and degummed. Information as to the method best adapted to degumming is at present not to be had.

Yield.—You may rely on a crop at least every six months. Each plant yields on an average 45 stems each cutting—that is to say, 180 stems per year per plant, or 72,000 plants per acre, if planted 4,000 to the acre.

The average weight of the stems, stripped clean, being 50 grammes, the annual yield per acre will be 36,000 kilogrammes, or 64,800 lb.

Taking into calculation an average yield of 5 per cent. of raw fibre, the acre will yield 1¼ tons of dry China grass, at a market price varying between £18 to £22, according to the care bestowed in keeping out impurities and producing a uniform long-fibred, even-coloured product. The acre will thus show a yield of £22 10s. to £27 10s. Allowing 25 per cent. for expenses (a liberal allowance, based on labour twice as high as Jamaican labour), the net income per acre will amount to £18 to £22, a figure which should prove attractive enough perhaps to induce some planters to at least give ramie cultivation a thorough and fair trial.—"Journal of the Jamaica Agricultural Society."

EXPERIMENTS IN CREOSOTING AND BLOCKING WET RUBBER.

By J. C. WILLIS and M. KELWAY BAMBER, Royal Botanic Gardens, Ceylon.

In accordance with a suggestion made by one of us at the Rubber Exhibition, experiments were commenced to test the possibility of sending home undried block rubber preserved with the aid of creosote.

It was impossible at the time to obtain the crude creosote in Ceylon, so experiments were made with the pure article. In order to mix this perfectly with the latex, it was first dissolved in methylated spirit, as recommended by Parkin in 1899.

Acetic acid was added in the usual way, care being taken not to add too much, and the latex was rapidly coagulated in a Michie-Golledge machine.

As soon as coagulation was complete, the mass was cut up, passed once or twice through the washing machinery to remove excess of soluble matter, and then immediately blocked for two or three hours in a wooden mould in a screw-press.

The block so prepared contained from 8 to 9 per cent. of water, but, with better fitting moulds and rather higher pressure, this might be reduced to 7 per cent. if necessary, and kept fairly uniform.

A drawback to the rapid coagulation in the above machine is the formation of a spongy rubber, which, when blocked, does not have a very satisfactory appearance. Better results as regards appearance can be obtained by coagulating the rubber in tins or troughs of any length, but of the width, or twice the width, of the mould blocks, and cutting this into the requisite lengths or shapes with a sharp knife, and filling the mould with the pieces.

The troughs should have outlet cocks beneath to run off the water and impurities, and the rubber can be washed without manipulation by half-filling the trough once or twice with clean water from a spray nozzle or from below.

Rubber prepared in this way amalgamates perfectly in the mould, and a homogeneous mass is obtained.

The blocks rapidly darken on the outside as they dry, and then look and smell very like the block of (South American) fine hard Para exhibited at the Rubber Exhibition.

Samples prepared in the above manner were immediately taken home by Mr. Brett, one of the rubber judges at the exhibition, and he has just cabled as follows:—

"Value per lb., 5s. 6d.; containing moisture 9 per cent.; continue experiments; strength excellent, better than average plantation rubber."

As ordinary Ceylon plantation rubber contains less than 1 per cent. of moisture, this price is evidently equivalent to 6s. per lb. for the actual rubber contained in the sample. Now, the actual sales on the same day were—"Culloden, 5s. 9½d.; seven other estates, 5s. 7¼d." Our rubber, therefore,

obtained a price 3d. better than the exceptionally good lot sent from Culloden, and the price thus compares very favourably indeed with any hitherto realised, though not yet up to that of fine Para from South America.

The following table shows the composition of this rubber after drying ten days, and the average of good Ceylon biscuit:—

	Creosoted Wet Rubber.	Average Ceylon Biscuit.
Moisture	7·06	0·45
Ash	0·18	0·34
Resin	1·92	2·01
Proteids	3·67	2·37
Caoutchouc	87·17	94·83
	100·00	100·00
Nitrogen	0·58 per cent.	0·37 per cent.

This analysis was made after the rubber had been drying for ten days; the original moisture was 9·13 per cent. The portion of the same sample sent to London was protected from loss of moisture, and contained about 9 per cent. on arrival. It will be noticed that the proteid matter is higher than usual, and the resin and ash rather lower.

This experiment, though obviously incomplete and partial, points to the conclusion that we were removing too much from our rubber, especially in the way of moisture, and that in future it will be advisable to block the rubber in wet condition, provided that it is rendered antiseptic by the use of creosote or other preservative.

From this experiment it is evident that the erection of large factories for the mechanical treatment and the drying of rubber would be premature, and it would be advisable to wait while the experiments are being confirmed on a larger scale.

Such experiments are now in progress, the chief points to be determined being—

1. The minimum amount of creosote or other antiseptic to be used;
2. The best proportion of water for strength and quality;
3. The best means of ensuring a *constant* proportion of moisture;
4. The amount of resin and proteid matter that can be left in the rubber to obtain the best strength.

RUBBER TAPPING.

In tapping rubber-trees, much depends upon the manner in which it is done, and on the kind of tapping knife used. Various patterns of knives have been placed on the market, the latest being those here depicted—the Bowman-Northway patent.

It is most important to keep the knives sharp, as a clean cut with a sharp knife increases and allows the latex to run free to the cups, and, therefore, gives less scrap; it is also an advantage to aid the flow to run water down each cut as soon as it is made. If this is done, it is not necessary to put water in the cups as customary, to prevent the latex coagulating. A good method is to run a pencil-shaped stick along the cut *from the bottom upwards*, the head of the pencil being wrapped in a ball of cloth, which is kept moist and pressed as the pencil is drawn along the groove.

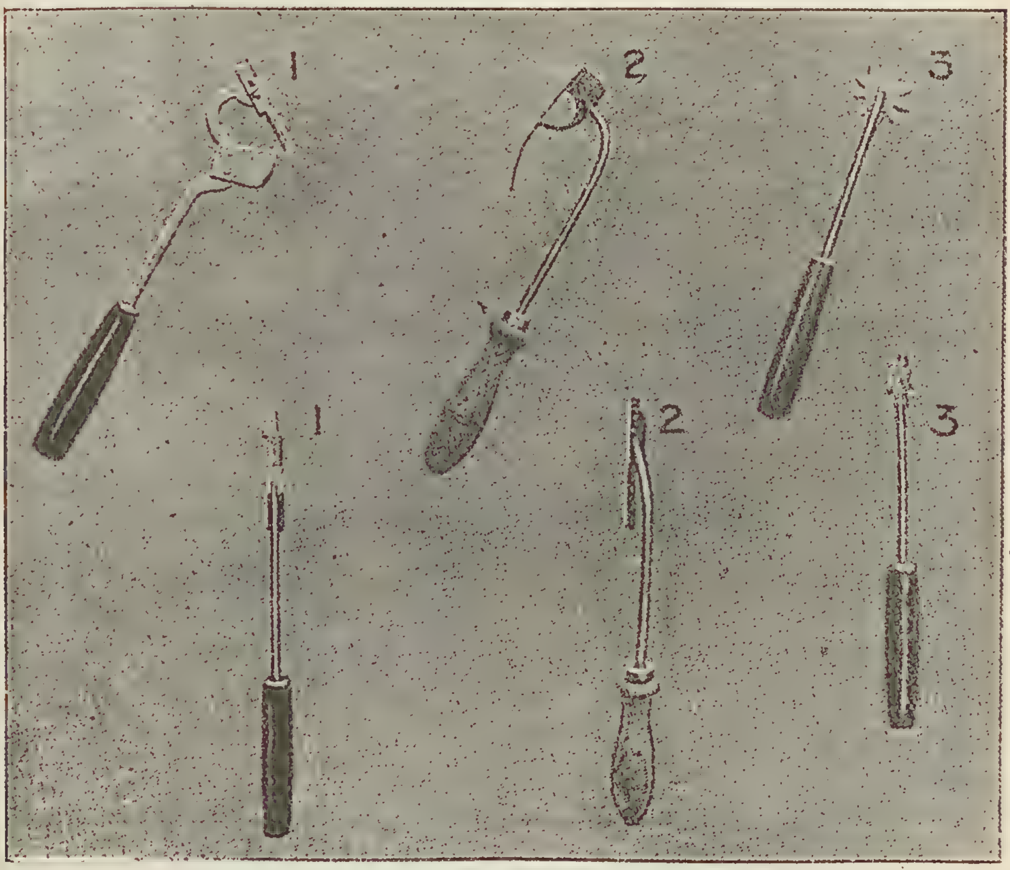
TASK WORK TAPPING.

With regard to the marking of the trees, this cannot be done by task; the work may be carried out throughout the day by special, intelligent coolies.

It will be noted that, throughout these notes, coolie labour only is considered. In North Queensland the work will be carried out, as a rule, by white men; and, judging by the working qualities of the Sinhalese coolies, as described in our article in this issue on cotton-planting in Ceylon, the white labourer, provided he be a steady man, should be able to do far more than the lazy coolie. A trained coolie can cut 400 feet in a day; therefore, to lay out a fixed task of trees per coolie, taking forty trees (18 inches circumference) as equivalent to 400 feet, the task for trees of different diameter would have to be regulated proportionately. Thus, 40 by 18 being equal to 720, the circumference of the different trees, being added together till they amount to 720, would be a coolie's task. The object of giving a task of trees is to fix each man's daily task for one month. He works at the same trees every day of the month he turns out, and is alone responsible for the tapping of those trees. Should the coolie be unable to tap his trees for a few days through illness or other cause, the trees should be left untapped till he returns to work at them.

Following the "System of Tapping," the trees after one month's tapping rest a month; therefore it is advisable, if practicable or convenient, to also lay out the task for the second month's tapping for the same coolie adjoining the first, so that when he has worked at one lot of trees one month, he will work on the second lot the second month, and back to the first lot of trees after the month's rest. In this way every tapping coolie on an estate has his special row or plot of trees set to work upon till finished.

The accompanying diagram shows the best knives for tapping rubber-trees. The cost runs from 2s. 3d. to 4s. 6d. each.



The Bowman-Northway Patent Rubber Tapping Knives.

No. 1 knife is used much like a plane, the head being suitably adjusted to shave the bark gradually, and, as soon as the proper depth is reached, the bark is of a white colour, getting lighter and lighter the nearer you get to the *cambium*, so that by practice it is possible to tell almost correctly when the right depth has been cut.

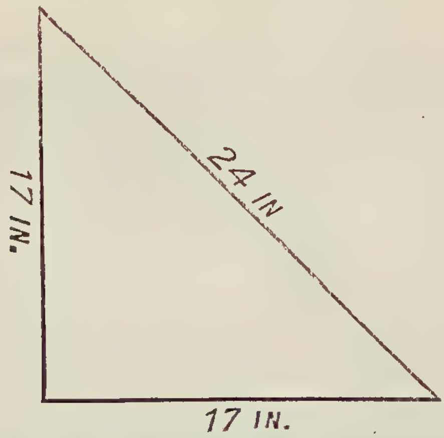
Young trees are more difficult to cut to the correct depth than old ones, as the white bark next to the *cambium* mentioned above is very thin indeed; it is, therefore, advisable to mark lightly with No. 1, and reach the correct depth gradually with a few tappings with the No. 2, in the manner described below for cutting deeper.

No. 2 knife is used for paring off the lower edge of the groove originally made, and when cutting should be held so as not to make the cut deeper than the previous ones, which is effected by holding the knife at the proper angle. Leaning the knife over to the right makes the cut deeper, while leaning over to the left makes it less deep. The object in every case being not to cut deep enough to touch the *cambium*.

No. 3 knife is a puncturing tool. Its object is to puncture the under bark and *cambium* to tap the latex attracted there by the use of No. 2 knife.

The system consists first in marking out the grooves and correct distance and angle at which they are to be cut into the tree. This is effected by means of a guide in the shape of a right-angled triangular piece of tin, the side subtending the right angle being 2 feet in length, and the other sides 17 inches by 17 inches approximately.

The guide for marking the trees is shaped thus—



The grooves to be cut along the sloping side of the triangle will then be at an angle of 45 degrees to the base, each groove 2 feet long and at intervals of 1 foot, starting 1 foot from the base of the tree up to a height of 5 feet, and all leading into a vertical channel running down to within a few inches from the ground level, a small tin spout being inserted at the lower end of this vertical channel to convey the latex into the tin vessels which are placed on the ground near the tree. The tin spout is left in position permanently, thus obviating the necessity of constantly inserting cups into the bark and removing them, thereby causing unnecessary injury to the tree. In the case of a tree 18 inches in circumference, the grooves would go nearly once round, and, therefore, for trees of this size there would be one vertical channel to convey the latex flowing from the several spiral cuts into the tin receptacle, only one of which will be needed. A tree 36 inches in circumference would require two vertical channels on opposite sides of the tree, and, correspondingly, a tree 54 inches in circumference would take three vertical channels, each leading into a tin receptacle placed on the ground as previously stated. To suit trees of various sizes and yielding capacities, the grooves can be made longer or

shorter as may be found necessary or convenient. For making the first incision the Bowman-Northway Patent No. 1 knife is used, by means of which a groove of rectangular section is cut out. In subsequent operations on the same tree the No. 2 knife is used, by means of which a thin section is pared off the lower side of the groove while protecting the *cambium* from injury. This is used alternately with the No. 3 knife, or puncturing tool. This process, which must be carefully carried out, may be continued daily for one month, and tapping renewed after giving the trees a rest of, say, one month. One month's tapping would carry the grooves down about 1 inch, so that tapping on and off, one month at a time, the whole space between the top and bottom grooves would be covered in the course of two years' work, the operation being carried on continuously, so that at the end of each period of two years only the original top cut would have to be renewed, the lower cuts being continued into the next sections below, which by that time will have completely renewed their bark.—Exchange.

RUBBER NOTES.

THE CEYLON RUBBER EXHIBITION.

In their annual review of the India rubber market for 1906, Messrs. S. Figgis and Co. say:—"The exhibition held in Ceylon in September was most interesting and useful, and plantation rubber of all descriptions was nicely shown. We contributed a case of specimens of most varieties of rubber, and presented it to the Government of Ceylon for their museum. No doubt planters learnt much from it, but we do not believe that we can indicate from Europe much improvement in the mode of preparation or cultivation of rubber beyond the general advice we have repeatedly given to—Pack it in good dry condition (excess of resin much objected to) into strong case of 1 cwt. to 2 cwt. each. No paper, Fuller's earth, &c., to be used. Keeping different qualities and colours separate, and not to mix immature rubber with older; to pick out and send separately dirty, barky pieces. To smoke the rubber when convenient, because 'smoking' appears to increase its resiliency, but keep it as clear and yellow as possible.

THE WORLD'S SUPPLY OF RUBBER

in 1906 we estimate nearly at 65,000 tons, and consumption almost as much. Planting has greatly increased, and will produce much more in the near future. We estimate planted and planting (but some mixed with tea and cocoa and coffee): Ceylon, 100,000 acres; Malaya, Malacca, Sumatra, &c., 90,000 acres; Borneo, 12,000 acres; Java, 20,000 acres. Mexico has some large plantations, also Nicaragua and Honduras, and some in Columbia, Ecuador, Bolivia, and Peru. India has begun, say, 10 to 20,000 acres planting; Burmah and Mergui beginning; the Philippines, Samoa, Hawaii, and other Pacific isles, and Seychelles and West Coast Africa will add to the supply, also the West Indies. In the Congo and German West Africa plantations are in progress. We repeat our caution to plant, where practicable, *Hevea brasiliensis*, as hard clean rubber sells best."

[Rubber planting is proceeding apace in North Queensland. We understand that several thousands of Hevea trees have lately been planted at Mourilyan, and at Kamerunga the oldest trees are being tapped.—Ed. "Q.A.J."]

RUBBER-PLANTING.

Messrs. Figgis and Co., in their annual review of the rubber industry, give some interesting figures in connection with rubber-planting and prices:—

Planting, they say, has greatly increased, and will produce much more in the near future. We estimate planted and planting (but some mixed with tea

and cocoa and coffee): Ceylon, 100,000 acres; Malaya, Malacca, Sumatra, &c., 90,000 acres; Borneo, 12,000 acres; Java, 20,000 acres. Mexico has some large plantations, also Nicaragua and Honduras, and some in Columbia, Ecuador, Bolivia, and Peru. India has begun, say, 10,000 to 20,000 acres planting; Burmah and Mergui beginning; the Philippines, Samoa, Hawaii, and other Pacific isles, and Seychelles and West Coast of Africa will add to the supply; also the West Indies. In the Congo and German West Africa plantations are in progress. We repeat our caution to plant, where practicable, *Hevea braziliensis*, as hard, clean rubber sells best.

REVIEW OF PARA PRICES FOR 1906.

The year opened with a quiet market and sales of fine hard at 5s. 4½d., soft 5s.4d., negro-head scrappy 4s., Cameta 3s. 3d., Island 3s. 3d., Caucho ball spot 3s. 10d. With few sellers and a powerful "bull" movement here and in America, hard fine advanced by March to 5s. 6d., and soft 5s. 4d.; ball was then 3s. 8½d. to 3s. 9d., scrappy 3s. 11d., Cameta 3s. 2¾d., Island 3s. 1½d. The market became dull, and declined till July, which was about the lowest of the year—fine hard to 5s. 1d., soft 5s. 0¼d., Cameta negro-head 3s. 0¼d., Island 2s. 9d. Prices rallied a little during the succeeding months, and in October hard fine was 5s. 3d., soft 5s. 1¾d., scrappy 4s. 1½d., ball 4s. 1½d., Cameta 3s. 0½d., Island negro-head 3s. In November hard fine declined to 5s. 1½d., and soft to 4s. 11¾d. (the lowest point of the year), but ball was dearer at 4s. 3d., and negro-heads steady. Closing prices of fine hard 5s. 2½d., soft 5s. 0½d., scrappy negro-head 4s. 0¾d., Cameta 3s. 1½d., Island 3s.; Caucho ball, spot 4s. 3d., February-March 4s. There was but little speculation throughout the year.

THE SISAL FIBRE MARKET.

The "British Trade Review" gives the following market prices for sisal fibre:—

Mexican.—Fairly active; 33s. 6d. paid for dock lots and 34s. for distant shipments. Indian dearer under small supply; value 18s. to 31s. Central American a large turnover; value 28s. to 30s. Egyptian.—The annual arrival of 184 bales sold at extreme rates—namely, 40s., and waste 14s. 9d. New Zealand firm, but less doing; value, good fair and fair 39s. and 35s. 6d. Tow value 14s. Manila dearer in all positions. The past year's production shows an important shrinkage, and probably consumption has also been less:—

	1901.	1902.	1903.	1904.	1905.	1906.	
On hand, 31st December...	1,189	796	2,598	1,386	3,147	1,853	tons
Imported	1,320	2,509	2,439	3,823	5,404	2,725	„
Delivered	2,594	2,353	1,898	3,835	4,996	3,796	„

RAMIE IN WEST INDIES.

The cultivation of ramie is being taken up in Jamaica under the stimulus of the recently formed Ramie-growing Association. Ramie is not altogether new to Jamaica. About fourteen years ago, under the advice of Sir H. A. Blake (then Governor), a large acreage was put under cultivation, but owing to the faulty methods of decortication then in vogue the venture was a failure. Now, however, new machinery has been invented, and the results of the present experiment will be awaited with interest.

Forestry.

EUCALYPTUS FOR TIMBER.

In view of the ever-increasing demand for timber and the proportionate denudation of forests in most parts of the world, anything which can conduce to an improvement in the latter direction, and also to giving better facilities for trade between the States of the Commonwealth, must naturally prove of interest to a very large section of the community. Recently at the A.N.A. Exhibition, in Melbourne, the forestry exhibits were much admired, and very heavy orders could have been taken, especially for crowsfoot elm, a timber superior in every respect to American hickory, had there existed facilities for fulfilling such orders. Notwithstanding the fact that our forests abound with splendid commercial timbers, and that not only southern manufacturers, but even our own sawmillers are anxious to obtain supplies, the want of communication between the forests and the mills prohibits the production of any large supplies, added to which the attraction and greater profits of dairying have caused the withdrawal of many teamsters from the logging business.

The following bulletin (No. 8) of the United States Forest Service is a most interesting publication, showing, as it does, the great value of the eucalypts for commercial purposes:—

The wood of eucalyptus has not been extensively used by manufacturers in the United States, because the supply has not been sufficient to establish a market. Blue gum, the most common species in California, has, however, competed with black locust for insulator pins, has given satisfactory service in chisel and hammer handles, and has been used locally for wagon tongues, axles, shafts, spokes, hubs, and felloes. It is hard, strong, and tough.

In co-operation with the State of California, the Forest Service recently completed a study of the mechanical and physical properties of the common eucalyptus. The tests, made at the State University at Berkeley, were to determine whether eucalyptus can be substituted for some of the hardwoods that are becoming difficult to obtain.

Blue gum is by far the fastest growing species. The height and diameter of trees from which the test places were taken, is given in the following table. All the trees were about fifteen years old:—

Species.

Common Name.	Botanical Name.	Diameter. Inches.	Height. Feet.
Blue gum	(*Eucalyptus globulus*)	30	101
Sugar gum	(*Eucalyptus corynocalyx*)	15	73
Karri	(*Eucalyptus diversicolor*)	16	72
Manna gum	(*Eucalyptus viminalis*)	12	60
Red gum	(*Eucalyptus rostrata*)	9	47
Leather-jacket	(*Eucalyptus punctata*)	10	43
Red mahogany	(*Eucalyptus resinifera*)	8	38

An important point in considering the value of commercial plantations of eucalyptus is brought out in the second table, which shows that the fastest growing are also strongest:—

TESTS.

Species	Age in Years.	Bending— Number of Tests.	Modulus of Rupture, Lb. per Square Inch.	Compression Parallel to Grain— Number of Tests.	Crushing Strength, Lb. per Square Inch.
Sugar gum ...	15	5	25,344	11	11,290
Blue gum ...	30	12	23,265	15	12,310
Leather-jacket ...	15	3	19,267	10	10,908
Karri	15	8	18,386	17	8,795
Blue gum	15	28	16,900	34	8,190
Red mahogany ...	15	4	14,550	2	7,920
Red gum	15	9	14,380	6	7,723
Manna gum ...	15	12	13,093	20	7,309

A comparison with Forest Service tests on hickory shows that thirty-year-old blue gum is stronger than hickory, and that fifteen-year-old sugar gum is nearly as strong as black hickory and 91 per cent. as strong as second-growth hickory.

The wood of very young and sappy trees is apt to warp, but that from more mature growth can be easily handled to prevent warping. Early seasoning should proceed slowly. Open piling is desirable; the stacks should be high to secure weight, and should be covered.

Several of the eucalypti grow rapidly in California, and, under forest conditions, form straight, tall boles free from branches. They have, therefore, especial value as timber trees.

BEEF AT EIGHT GUINEAS PER POUND.

Under the heading of "Lucullus Emulated," the "Buenos Ayres Standard" of 4th November last tells a capital story of an expensive dish at a recent breakfast given there.

It is not very often beef is eaten which can be estimated at a cost of 8 guineas per lb., but such is the case in connection with the breakfast mentioned.

A number of South American importers and their friends assembled to eat the flesh of the famous young bull Bapton Viceroy, purchased in England for Mr. Manuel J. Cobo at the figure of 3,000 guineas. Together with part insurance and other expenses, Bapton Viceroy, when he was landed on Argentine soil, cost 4,000 guineas. He was only sixteen months old, was bred by Mr. Deane Willis, won the yearling class at the Royal Show, and was sold through the instrumentality of Mr. Frederick Miller, of Birkenhead, to Mr. Cobo. When landed at Buenos Ayres, the bull calf was ordered to be slaughtered by the sanitary authorities. The flesh of Viceroy was so tender and sweet that it was declared to be the best ever sampled in the Argentine. Mr. James Sidney, the chairman, said they all deeply deplored the loss of the famous bull calf to the Republic. The company drank "in silence" to Mr. M. J. Cobo, who was the distinct loser by not being able to take the bull to his great breeding establishments at Las Barracas and La Belen.

The bull, it should be added, was only partly covered by insurance, and the difference between the cost of the animal and the insurance falls upon Mr. F. Miller, the exporter.

Science.

ANALYSIS OF ENSILAGE FROM BIGGENDEN STATE FARM.

(Samples of Ensilage Eight Months Old.)

—		Maize, No. 126.		Sorghum, No. 127.	
		Wet.	Dry.	Wet.	Dry.
Crop, tons per acre		26½	...	30	...
Moisture	%	78·40	...	76·40	...
Dry substance	%	21·60	100·00	23·60	100·00
Sol. proteids	%	·73	3·38	·41	1·74
Insol. proteids	%	·46	2·13	·34	1·44
Total proteids	%	1·19	5·51	·75	3·18
Woody fibre	%	5·17	23·90	6·65	28·18
Pentosans	%	3·84	17·77	5·25	22·24
Starch	%	2·70	12·50	2·47	10·46
Sol. carbohydrates (sugars)	%	Traces	Traces	Traces	Traces
Crude fat	%	·33	1·53	·44	1·86
Chlorophyl, amides, &c.	%	9·34	43·25	8·46	35·84
Crude ash	%	2·56	11·85	2·05	8·69
Watery extract—					
Total sol. matter	%	4·75	22·00	4·80	20·33
Sol. nitrogen	%	·210	·97	·126	·53
Sol. ash	%	1·20	5·55	·48	2·03
Total nitrogen	%	·285	1·32	·182	·771
Proteid ,, ...	%	·190	·88	·121	·513
Amide ,, ...	%	·095	·44	·061	·258
Albuminoid ratio		1 : 11·3		1 : 22·1	
Total acidity as lactic acid	%	·180	...	·223	...
Free volatile acid (acetic)	%	·020	...	·019	...
Combin. ,, ,, ...	%	·060	...	·007	...

Both samples of silage are good fodders, more particularly the maize ensilage. The degree of acidity is rather higher than usual, and this may be due to the manufacture on such a small scale; still it is very interesting to see how such succulent fodders can be preserved for nearly a year even on a small scale.

J. C. Brunnich, Agricultural Chemist.

THE DIVINING ROD.

Mr. R. E. Soutter, manager of the State Farm at Bungeworgorai, writes us as follows:—

With reference to the article appearing in the January issue of the "Agricultural Journal," under the "Science" heading, on the "Divining Rod," which notes the failure of reputed "dowsers" to locate known springs, water mains, underground tanks, &c., when put to the test, I have been requested by a well-sinker of twenty years' standing, who read the article, and with whom the divining rod is not an unknown quantity, to state that the loosening of the soil, similar to that which would be necessary in putting down drains, tanks, &c., is sufficient to sever the bond of sympathetic sensibility, or whatever it may be defined, between man, rod, and water, or, at least, his experience has made him of this opinion.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.											1907.	
	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
North.													
Bowen ...	8·73	6·29	0·78	6·34	0·69	0·04	0·36	3·41	1·76	0·99	11·01	2·53	3·74
Cairns ...	16·87	16·05	5·20	4·04	3·44	2·28	1·79	1·57	0·56	13·26	11·31	18·36	11·49
Geraldton ...	37·67	19·67	11·51	7·93	16·05	5·73	6·65	4·26	2·28	21·08	21·20	29·58	25·26
Herberton ...	3·73	4·67	1·2[illegible]	1·38	1·04	0·59	0·55	0·38	0·30	5·16	10·82	10·56	11·77
Hughenden ...	3·93	8·47	0·12	Nil	Nil	Nil	Nil	0·92	0·61	0·51	†3·76	1·98	3·83
Kamerunga ...	13·76	14·93	4·94	4·13	3·55	2·49	2·03	2·56	0·72	10·00	8·17	15·78	14·82
Longreach ...	8·61	12·25	Nil	0·22	Nil	0·11	Nil	4·11	2·16	0·66	0·51	1·22	0·49
Lucinda ...	49·97	25·88	10·12	3·77	3·02	0·40	...	Nil	1·85	6·60	*22·36	12·38	23·82
Mackay ...	9·88	16 57	2·87	11·87	3·85	0·68	0·93	4·35	2·63	1·80	12·93	2·72	*6·25
Rockhampton ...	15·31	8·26	Nil	5·27	1·12	Nil	2·61	3·80	1·07	0·46	5·19	4·15	4·12
Townsville ...	17·31	4·28	0·38	1·80	0·30	Nil	0·46	3·25	1·45	7·74	14·03	12·49	7·75
South.													
Barcaldine ...	7·07	13·84	Nil	1·70	0·19	0·10	Nil	2·88	2·92	1·33	1·04	3·44	0·43
Beenleigh ...	15·11	9·34	0·04	3·57	1·47	0·16	2·94	3·47	2·94	1·75	3·98	4·75	3·88
Biggenden ...	8·24	4·61	0·45	5·77	1·42	0·48	3·02	5·07	1·19	3·09	†4·55	5·77	3·55
Blackall ...	11·14	11·99	Nil	1·75	0·22	0·48	0·02	4·70	5·86	1·37	1·96	2·30	Nil
Brisbane ...	12·71	4·85	0·45	3·23	1·38	0·22	4·21	3·48	3·81	1·07	3·28	2·69	5·23
Bundaberg ...	9·92	1·90	1·17	8·44	2·01	0·03	1·86	10·90	1·57	0·97	3·85	3·29	3·90
Caboolture ...	12·73	6·46	0·49	4·53	0·85	0·29	3·02	4·77	4·73	4·26	3·15	2·53	8·03
Charleville ...	10·66	3·15	0·07	...	0·13	2·34	0·35	4·99	2·66	1·30	3·71	0·85	Nil
Dalby ...	4·43	5·15	1·81	0·66	0·87	1·58	2·78	2·65	2·96	2·12	5·67	5·60	1·34
Emerald ...	7·81	5·22	0·08	2·12	0·17	Nil	1·62	4·47	1·55	2·32	1·79	7·36	3·67
Esk ...	6·79	9·04	1·74	3·25	0·77	0·38	4·51	4·14	2·90	2·45	5·26	2·87	6·79
Gatton College ...	5·33	9·43	1·40	1·90	0·60	0·41	3·73	3·54	2·25	2·01	3·45	2·62	6·44
Gayndah ...	9·65	5·86	0·51	5·10	0·48	0·22	2·34	5·14	2·25	4·25	2·82	3·00	1·91
Gindie ...	9·15	5·92	Nil	2·32	0·05	Nil	1·46	4·57	3·20	2·95	1·45	4·58	0·71
Goondiwindi ...	2·60	2·19	0 37	2·80	0·98	0·49	4·35	3·33	2·36	2·32	4·04	5·37	1·77
Gympie ...	7·38	5·58	0·45	6·88	2·26	0·52	3·19	3·97	3·03	4·12	5·32	3·99	6·96
Ipswich ...	7·22	3·87	0·12	1·67	0·25	0·17	2·59	2·94	2·60	0·71	4·22	2·17	5·38
Laidley ...	5·63	6·73	0·35	2·83	0·49	0·50	3·26	3·19	2·87	1·78	4·12	2·84	4·50
Maryborough ...	8·34	6·77	1·08	4·85	2·55	0·15	2·31	6·48	1·22	2·49	4·39	5·41	7·84
Nambour ...	16·50	9·35	1·13	6·20	3·68	0·61	4·52	8·94	4·89	3·40	6·74	5·74	12·05
Nerang ...	13·68	10·04	0 87	10·32	1·98	0·12	3·56	6·42	8·26	2·75	6·33	9·86	6·04
Roma ...	12·95	3·94	Nil	1·09	1·08	1·65	1·47	4·43	2·37	1·32	4·31	6·32	2·92
Stanthorpe ...	2·76	3·18	2·00	0·77	0·45	1·44	3·37	4·29	2·90	2·49	4·89	4·33	3·30
Tambo ...	9·05	10·63	Nil	0·66	0·05	0·67	0·07	5·17	2·85	1·23	1·16	4·74	1·81
Taroom ...	13·73	6·02	0·23	1·04	0·81	0·60	2·30	4·26	1·70	1·35	5·49	5·16	1·10
Tewantin ...	18·59	7·57	2·27	4·61	5·68	0·39	4·25	6·37	4·38	2·73	9·53	6·38	15·83
Texas ...	2·11	1·94	1·89	1·57	0·75	0·90	3·22	2·77	3·42	2·23	1·83	4·69	4·55
Toowoomba ...	6·58	8·87	2·07	2·65	0·85	1·81	3·63	4·55	2·76	2·65	4·11	3·94	4·00
Warwick ...	2·21	6·27	0·37	0·77	0·57	1·16	3·85	3·13	2·47	2·99	5·50	3·95	2·52
Westbrook ...	4·01	5·12	0·93	0·50	0·55	1·67	2·80	3·34	3·41	‡	1·48	1·79	2·91

* From telegraphic reports.

GEORGE G. BOND,
For the Hydraulic Engineer.

General Notes.

SUGAR-GROWING IN NEW SOUTH WALES.

It is estimated that the total output of sugar during the season just concluded will reach 25,000 tons. Broadwater passed over 100,000 tons of cane through the rollers, and Harwood 67,000 tons in a run of twenty-two weeks.

The season, though not the best that has been experienced on the rivers, has been good, and farmers have little cause to complain at the average tonnage of cane harvested. Some yields have been phenomenally high, and the whole crop has been remunerative. In all cases the mills have had considerable difficulty in getting the cane cut; not that there was any dearth of labour, but the class offering was frequently altogether unsuitable. It is stated that the large cheques received by some farmers will induce them to plant next season, and in some places land is already being put in order. In view of the fact that another company propose building a mill on the Richmond, there may be a partial return to cane-growing on the rivers in future years.

BEET SUGAR IN VICTORIA.

From the latest reports before the Minister for Agriculture (Mr. Swinburne) it appears that 600 farmers in Gippsland have agreed to put between 1,500 and 1,600 acres under sugar beet this year, so that the Maffra Beet Sugar Works may be reopened. In order to give a sufficient crop to assure profitable working, it is estimated (says the "Argus") that 3,000 acres should be put under crop, but Mr. Swinburne says if he can get promises that 2,000 acres will be cultivated he will be prepared to recommend to the Cabinet that the works be again started. He will not be able to tell his colleagues that it will pay to treat the produce of 2,000 acres, but he is quite satisfied that an effort should be again made to establish the beet sugar industry in Victoria, and that, if the works are started, any loss entailed in the first year will be made good later, when a larger output of beet comes to be dealt with. The grass rights of the paddock adjoining the factory have been leased for a year, subject to a month's notice at any time if the land is required.

MINERAL OIL.

With a view to account for the presence of mineral oil underground in certain parts of Europe and Pennsylvania, some ingenious persons have assumed that oil is a decomposition product of long-buried organic remains. But the answer to this is, that oil is found in very old strata, when but few organic remains can have existed. A famous chemist having visited the Pennsylvania wells, puts forwards his opinion of this interesting question. The substance of the earth having been condensed from vapour, the interior of the earth must consist largely of metals (iron predominating) in combination with carbon. Wherever fissures have been produced in the earth's crust by volcanic action, the water which, of necessity, made its way into the interior of these, came into contact with metallic carbides, at high temperatures and pressures, which must have given rise to saturated hydrocarbons, and have ascended in the form of vapour to strata, where they condensed and thus formed the oil. Such processes must have taken place in the Roma district, where the bore has shown the presence of water, gas, and oil; and such being the case there appears to be no reason to doubt the presence of oil, possibly in large quantities, beneath the surface, a matter which will ere long be determined by the exploratory bore about to be put down at Roma by the Mineral Oil Company.

MEASURING STACKS.

TO FIND THE CONTENT OF A ROUND STACK.

Where very great accuracy is not required, the content is sometimes found by taking the height of the stack from the ground to the eaves, and adding to this the third of the height from the eaves to the crown—the sum of these by the mean girth gives the cubic content.

The content thus found is less than the truth, but the loss is not great, seeing that the stack is not so dense at the top as at the bottom.

TO FIND THE MEAN GIRTH WHEN THE STACK TAPERS REGULARLY TO THE EAVES.

Add together the girth taken at the bottom of the stack and the girth taken at the eaves, both in feet; then half the sum is the mean girth. When the stack does not taper regularly, girths must be taken in several places and added together, and their sum divided by the number of girths taken; the quotient is the mean girth. Then with the mean girth found in one of these ways and the height of the stack from the ground to the eaves, find the content of this portion of the stack.

Next find the content of the top portion or roof by taking the girth at the eaves multiplied by the perpendicular height from the eaves to the crown of the stack, the third part of which is to be added to the content of the body portion already found, and their sum shows the content of the stack in solid yards and feet.

EXAMPLE.

Required the solid content of a circular stack, the girth at the bottom being 56 feet, the girth at the eaves 63 feet, the perpendicular height from the ground to the eaves 12 feet, and the perpendicular height from the eaves to the crown of the stack 9 feet.

CONTENT OF THE LOWER PORTION OF THE STACK.

Add together the two girths, 56 and 63 = 119, half of which is $59\frac{1}{2}$ feet—the mean girth.

Square this mean girth, and we have—

$$59{\cdot}5 \times 59{\cdot}5 = 3{,}540{\cdot}25, \text{ which is the area of the base.}$$

Now multiply this area by 10, and divide by 125 (or multiply by ·08, or

$$3{,}540{\cdot}25 \times 10 = 35{,}402{\cdot}5 \qquad 35{,}402{\cdot}5 \div 125 = 283{\cdot}2.$$

roughly by $\frac{1}{12}$)—

Multiply this by the height of the stack (12 feet)—

$$283{\cdot}2 \times 12 = 3{,}398{\cdot}4 \text{ cubic feet;}$$

which, reduced to cubic yards (27 cubic feet = 1 cubic yard), gives us 125 cubic yards as the solid content of the lower portion of the stack.

We now have to calculate

THE CONTENT OF THE ROOF.

Square the girth at the eaves (63 feet)—

$$63 \times 63 = 3{,}969.$$

Multiply by 10—

$$3{,}969 \times 10 = 39{,}690.$$

Divide by 125—

$$39{,}690 \div 125 = 317{\cdot}52.$$

Multiply by $\frac{1}{3}$ of the perpendicular height of the roof (9 feet): $\frac{1}{3}$ of 9 = 3. Then, $317{\cdot}52 \times 3 = 35{\cdot}28$ cubic yards.

Thus the whole stack is shown to contain—

In the lower portion	125 cubic yards
„ upper „	$35\frac{1}{4}$ about
	$160\frac{1}{4}$ cubic yards.

TO CALCULATE THE CONTENT OF AN OBLONG STACK.

Suppose our stack to have the following dimensions:—Length, 50 feet; breadth at the eaves, 17 feet; at the bottom, 12 feet; perpendicular height from the ground to the eaves, 13 feet; and from the eaves to the ridge of the stack, 7 feet. The following calculation will give the content in cubic feet:—

Get the mean breadth by adding together the breadth at the eaves and the breadth at the base, and divide by 2. That is—

$$\frac{17 + 12}{2} = \frac{29}{2} = 14{\cdot}5, \text{ the mean breadth.}$$

Multiply by the vertical height (13 feet):—

$$14{\cdot}5 \times 13 = 188{\cdot}5 \text{ square feet, area of lower portion.}$$

For the roof, multiply the breadth at the base of the eaves by half the perpendicular height from eaves to ridge.

$$17 \times 3{\cdot}5 = 59{\cdot}5 \text{ square feet, area of roof.}$$

Add the two areas together, and multiply by the length of the stack, and we get the cubic content as follows:—

$$188{\cdot}5 + 59{\cdot}5 = 248 \times 50 = 12{,}400 \text{ cubic feet,}$$

or nearly 460 cubic yards. The hay in such a stack would weigh perhaps 150 lb. per cubic yard (but this is a very variable quantity); hence the total weight of hay would be about 24½ to 25 tons. If it is a wheat stack, we may take a cubic yard to represent one bushel of grain. The stack should thresh out 460 bushels. But these weights are merely approximate, as both hay and grain vary largely in weight.

TO CALCULATE THE WEIGHT OF HAY IN THE STACK.

Hay necessarily varies in weight, according to quality, size of stack, age, &c.

New hay may weigh 8 or 10 stones per cubic yard (112 or 140 lb.). When the stacks are ten or twelve months old, the cubic yard may weigh 14, 16, 18, and as much as 20 stones.

Taking 140 lb. as the weight of a cubic yard, such a stack as we have described would contain 22,400 lb. or 10 tons.

THE QUANTITY OF GRAIN IN THE STACK

may be estimated at the average quantity of 1 bushel to the solid yard (Baildon); but, if the crop has been mown, a yard will not average more than 3 pecks.

STACKS OF STRAW

may be estimated at the rate of 18 to 20 yards to a ton.

CONTENT OF SILOS.

A question was put to us the other day which involves more intricate calculation. A farmer has a quantity of sorghum which he wishes to put into a silo, and wishes to know what sized building he would require. We find that his crop will take up a volume of 25,000 cubic feet.

We know that a building 20 feet long, 12 feet broad, 10 feet high to the eaves, with an additional height of 6 feet from eaves to ridge, will contain 2,880 cubic feet. Now, without going into the calculation here, which involves the extraction of the cube root, we find that, by doubling all the dimensions above given, the building will hold 24,960 cubic feet of silage.

Silos.

Every 50 cubic feet of the volume of a silo will hold a ton, allowing 45 lb. as the average weight of a cubic foot of silage.

WINDMILLS.

The following information on windmills is taken from King's "Physics of Agriculture":—

If we except horse-power and that of cattle, there is no form of motor which has been so generally or so widely used on the farm as the windmill, and its use is daily increasing, especially now since all parts are made of steel, well galvanised to protect them from rust, and their relative efficiency has been increased.

WORK TO WHICH THE WINDMILL IS ADAPTED.

It must not be understood that a windmill is well suited to furnish power for any and all kinds of farm work, if only it is made large enough. On the contrary, it is only adapted to certain lines where the work done can be accumulated at times when the wind is favourable, such as pumping water for stock and for the supply of the house, if only a suitably placed reservoir of sufficient capacity is provided; for grinding grain for stock, and for wood-sawing.

WIND PRESSURE.

The pressure which the wind may exert upon a surface depends primarily upon (1) its weight per cubic foot, (2) its velocity, and (3) the angle at which it strikes the surface.

ABILITY OF WIND TO DO WORK.

The work which wind can do depends upon the amount which passes through a given windmill per minute, and the pressure which it exerts. But, as the pressure varies with the square of the velocity, and the quantity passing the mill varies directly as the velocity, the theoretic working capacity of the wind must increase as the cubes of the wind velocity.

Thus, with miles per hour of ...	5	10	15	20	25	30	35	40
Or, taking 5 to 1, they are as ...	1	2	3	4	5	6	7	8
The relative horse-powers are as ...	1	8	27	64	125	216	343	512
Theoretical horse-power is ...	·025	·2	·675	1·6	3·125	5·4	8·575	12·8

Perry regards it approximately correct to state that a 12-feet windmill in a 5-mile wind may develop $\frac{1}{40}$ of a horse-power, and the figures in the last line in the table above are his.

RELATION OF DIAMETER OF WHEEL TO ITS EFFICIENCY.

In increasing the horse-power of an engine it is not usually necessary to increase its weight and strength much more than in proportion to the increase of power which is to be developed, but in the case of two wind wheels, having the same type of construction, the one which is to develop double the horse-power must have a strength of resistance practically eight times as great, in order to withstand the highest wind pressures to which it is liable to be subjected. This is so because doubling the diameter of the wheel not only makes the surface of wind pressure four-fold, but at the same time carries the centre of pressure farther from the axis of the wheel, causing it to act upon a longer lever arm. But to increase the strength of resistance of the wheel eight-fold makes it necessary to build it much heavier, and this detracts from its relative efficiency.

Besides this, with wheels of large diameter there are much greater differences in the wind pressure on the different parts of the wind sails, because the actual velocity of the sails increases with the distance of their points from the centre of the wheel. But the angular velocity must be the same in all parts of the sail, and this causes the wind sail to be forced around away from the wind passing through the wheel with very different velocities, and this difference reduces the relative efficiency, so that large windmills of like pattern do not increase the available horse-power as much as the size is increased.

Amount of Work Done by a Windmill in Pumping Water.

We have measured the amount of water which was pumped during one entire year by a 16-feet geared windmill. This mill was provided with three pumps arranged so as to lift water 12·85 feet whenever there was wind enough to enable it to do any work. When the wind was lightest it was given the pump of smallest capacity, when stronger the one of next size, when still stronger both together; the third pump being used only in the very highest winds.

The smallest amount of water lifted 10 feet high, in 10 days, was enough to cover 9·87 acres 1 inch deep, and this occurred from 28th July to 7th August, at the time when water for irrigation is most needed. The largest amount pumped was enough to cover 75·73 acres 1 inch deep.

Amount of Work Done by a Windmill in Grinding Feed.

Another set of trials, aiming to measure the amount of feed which may be ground with a 12-feet geared windmill, was made at the Wisconsin Experiment Station, and using the observed amounts of corn ground under a wide range of wind velocities, and the observed hourly wind velocities, as recorded for the pumping experiment, the amount of feed which could have been ground, had it been fed automatically and kept running continuously, has been computed and given in the table which follows:—

Table showing the amount of corn which could have been ground by a 12-feet aermotor windmill during the year, from 6th March, 1897, to 6th March, 1898, with all winds from 9 miles to 30 miles per hour.

Wind Miles per Hour.	No. of Hours of Wind.	Amount Ground per Hour.	Total Meal Ground.	Wind Miles per Hour.	No. of Hours of Wind.	Amount Ground per Hour.	Total Meal Ground.
		Lb.	Lb.			Lb.	Lb.
9	480	20·61	9,891	20	195	515·10	100,400
10	559	38·31	21,410	21	144	592·8	85,360
11	495	61·46	30,430	22	114	675·9	77,050
12	425	90·07	38,280	23	112	764·4	85,610
13	406	124·07	50,400	24	92	858·4	78,970
14	401	164·00	65,770	25	71	957·8	68,010
15	341	208·60	71,130	26	70	1,063·0	74,390
16	328	259·00	84,950	27	57	1,173·0	66,870
17	264	314·90	83,120	28	44	1,289·0	56,710
18	223	376·10	83,880	29	40	1,410·0	56,400
19	193	442·90	85,480	30	33	1,537·0	50,710

The total footing of this table shows that the mill might have ground an average of about 75 bushels of corn per day for the entire year, but this figure would represent the maximum amount of work possible. The minimum could hardly have been less than one-third of this amount.

DOES IT PAY TO SHIP CEDAR?

In view of the possibility of a demand setting in for Queensland cedar in England, we place before our readers the following interesting statements *pro* and *con*, which we take from "Tropical Life":—

A writer in the "Port of Spain Gazette," Trinidad, West Indies, says—No!

"In an article which we culled from the "Tropical Life," it will doubtless have been observed that that authority gives the London price of cedar as £9 14s. per ton. Since we published that extract, a good deal of discussion on the matter has taken place amongst many of the more prominent merchants. The arguments for and against shipping have been fought out and discussed, and we, therefore, think that the following compilation of figures will be of

interest. In the first place let us take 67 cents (2s. 9½d.) per cubic foot as being about the average price paid during the last month locally. For the benefit of those of our readers who are not quite *au fait* with the technicalities of the cedar market, let us explain that cedar is bought here by the cubic foot, provided that the logs average at least 10 cubic feet. A rough calculation shows us 55 cubic feet of cedar go to the ton. The freight is approximately 13 cents a cubic foot, or, say, 30s. per ton, which is equal to 55 cubic feet. Cartage and wharfage expenses should not exceed 2s. 6d. per ton.

"Taking insurance at ½ per cent., we must add 1s. per ton to the general expense. One ton of cedar is worth here about 35·75 dollars, and the interest on the money that would not be in use for sixty days would, therefore, be 36 cents per ton. Exchange on remittance at ½ per cent. would mean another shilling or thereabouts per ton, and commission on sale—2½ per cent.—takes away a further 5s., roughly speaking. Let us put the figures into accurate dollars and cents, and schedule them slightly, so as to make quite clear what we mean:—

	Dollars.	Dollars.	£	s.	d.
One ton of cedar is equivalent to 55 cubic feet, and fetches in London		46·56 =	9	6	6
Less charges—					
Freight on 1 ton	7·20				
Cartage and wharfage	60				
Insurance at ½ per cent.	24				
Interest for sixty days on 35·75 dollars (being value of 1 ton here) ...	36				
Exchange at ½ per cent. (on remittance)	23				
Commission on sale at 2½ per cent. ...	1·16				
		9·79			
Making net return of London sale (per ton)		36·77 =	7	7	4½

"Locally, 1 ton, or 55 cubic feet, will fetch, at present average market rates, 36·85 dollars. Therefore, it will be seen that it is better to sell cedar locally (at present) than it is to ship it away."

London wood brokers say—Yes!

1. We note the article in the "Port of Spain Gazette" on Trinidad cedar, and in answer would point out, that from all we can gather, 67 cents is above the average price paid per cubic foot in the island; logs, we are told, for instance, are sold at 40 cents only, whilst the average in London of £9 14s., referred to by the writer, is often greatly exceeded both in sales in London and sales on c.i.f. terms.

A parcel of small logs lately realised at auction in this market an average price of 5¼d. per sale foot, equal to over £11 per ton gross, and at least £10 10s. per ton net, less freight and insurance.

In our letter of 10th August, we quoted £9 14s. per ton as an average price, but in this *average* price must be included shipments of logs of smaller size than wanted by the trade, and also logs in bad condition.

2. With the abnormally high prices this wood has recently been fetching in the United Kingdom, and also on the Continent, on contracts made through London, we should imagine that the figures realised must have paid the shippers well, otherwise the shipments would not have been so heavy during the last few months. The normal price for Trinidad cedar is usually about £6 to £7 per ton, but we have sold, during the last few months, up to £10 2s. 6d. per ton, c.i.f., but just now the market is decidedly easier, and for similar wood about £9 per ton is the present quotation. We note that the article mentions a shipment of Trinidad cedar sold here at 5¼d., and which is said to have realised £10 10s. per ton net. If this is the lot we sold in our auction on 26th September at 5¼d. per foot super, that would mean only

£10 10s. gross, and net £9 5s. Although there is a considerable business done here in cedar, a great deal more is done on contracts made through London on c.i.f. terms to elsewhere, but, of course, the prices obtained (which must be satisfactory, or the business would not increase as it is doing) are due to the push and prestige of the London sellers.

3. Dealers are not in business for amusement, and if they buy outright from the producers they want a larger margin than if the wood were simply sent on consignment. It does not follow, remember, that if shipped on consignment the wood must necessarily be sold in London, although this market often offers a fine outlet in public auction. It would sometimes be found more profitable and show better results if the wood were sold through London on c.i.f. terms to some other port in the United Kingdom or on the Continent, this being a matter which can only be decided by an experienced broker when receiving advice of the shipment.

THE WATER HYACINTH.

When, about ten years ago, attention was being drawn to the water hyacinth as a beautiful aquatic plant, suitable for adorning fresh-water ponds and lagoons, we pointed out the great danger of this plant becoming a dangerous pest, and a menace to the navigability of the upper and reasonably fresh-water reaches of the coastal rivers.

If anything could emphasise our repeated warnings against the planting of the beautiful but pernicious water hyacinth in the fresh-water lagoons and creeks of the State, it would be the spectacle witnessed in the Brisbane River during the first week of March. The plant was introduced in the same way as the lantana, *Sida retusa*, cobbler's peg, Johnstone grass, nut grass, and other blessings, either as a curious exotic, to be carefully cherished, or, as in the case of mustard, wild oats, swamp couch, mixed with other imported seeds. At the time of its introduction few people in Australia had any knowlege of the disastrous effect of its spread in the United States. If they will look at the May, 1899, number of "Pearson's Magazine," they will then be able to form some idea of the loss and expense to which the people of Florida are subjected owing to the presence of the plant which we have heard called "The beautiful lilac devil." It first appeared in 1889. It soon choked out the water-lily, the wild celery, and all other aquatic plants. It has seized both banks of the river (St. John's), and floats in large compact masses on the surface, swinging backwards and forwards with the tide, which runs more than 100 miles up the river. Villages and towns on sluggish streams emptying into the St. John's are sometimes isolated for weeks and months, as no vessels can approach them. Often bridges are carried away by the pressure of the tangled masses of hyacinth. Boats and even steamers become helpless in it. Sawmills have had to cease work, as logs could not be towed to the mills, or sawn timber be got away. All net fishing is destroyed. Lake George, 19 miles long and 12 miles wide, is entirely covered by it. Yankee ingenuity has not been able to suppress the nuisance, yet hundreds of thousands of dollars are annually spent in forming water-ways through it. Few uses have been found for it. As a fertiliser it is almost valueless. Cows and pigs will eat it, and this ends the tale of its value. Much hope was built in Florida on the work of a certain red spider which appeared on the plant, but the insect did not multiply fast enough to effect any good result. Now, that red spider might do good work in Queensland. Florida has very cold winters—big freezes—and possibly the spiders love the warm summer. Hence, in sunny Queensland they might multiply exceedingly all the year round.

To return, however, to the Brisbane River. During the week named there was a considerable fresh in the river, and vast masses of the hyacinth broke adrift from the Brisbane and Bremer Rivers, near Ipswich, 50 miles away from the metropolis, and came careering down the river in large rafts. Vessels lying

Should refer to an article published previously in May 1901, and refers to March 1901.

at the Brisbane wharves were surrounded by it. Small steamers picked it up on their propellers. The ferryboats at one spot ceased running. The high tide, aided by the fresh, left quantities of the plant stranded above high water wash, where it has already taken root. Numbers of people, ignorant of its habit, have carried off baskets full of the pretty plant to set it in their waterholes and gardens. We are glad to see that the Brisbane Press has pointed out the great danger of propagating the hyacinth. A single root thrown into a waterhole will choke it up in a month. Cattle will carry it away on their hoofs and horns to other holes, and so the evil will be perpetuated, until the time will come when the municipal and rural authorities will find it necessary to raise funds, not for road-making, but for the destruction, or, rather, attempted destruction, of the water hyacinth. No attempts at its destruction have ever succeeded in Florida, and the small attempts in Queensland have not as yet resulted satisfactorily. So serious is this question of the water hyacinth that we have no hesitation in giving it as our opinion that the planting of the pest in any waterhole, or in any spot outside a kerosene tin or some such receptacle, should be regarded as a punishable offence. We need only imagine the results of the Condamine, Maranoa, Warrego, or any of our Western rivers being choked with the weed, to warn us against its introduction into these rivers. We understand that it is already thriving at Wallumbilla.

Fortunately, salt water is fatal to the life of the plant, so that no grounds exist for supposing that the tidal portions of our rivers will be troubled with it. Still, it will, when once rooted on the banks above the highest tides, quickly spread over the adjoining land, filling the water-tables and stretching out into adjacent paddocks, as it has done at O'Connelltown, on the Bowen Bridge road. There are few districts on the coast, and even above the coast range, where the pest has not taken hold. It exists all over East and West Moreton, is found at Laidley in lagoons, and in Lockyer Creek, and thence has been carried to the Central and Northern districts.

In 1901, we were favoured with a communication from Mr. Walter Draper, superintendent of the Government Gardens at the Barrage, Egypt, in which the following interesting notes occur on the destruction of the water hyacinth. He said:—It is perfectly hopeless to attempt the destruction of the pest during the growing season. Waterways may, of course, be cut through for navigation, but cutting only assists its propagation, and the danger of infecting clean districts by floating plants is very considerable. Nothing but a serious outlay, coupled with a thoroughly systematic plan of destruction, in the control of competent hands, will clear your State of the pest, and the longer the delay the greater will be the difficulty and cost of eradication. From personal observation in Egypt, I find that one plant will cover ten times its area in one growing period. In my opinion, the best time to operate in its final destruction is during the season when the plants are dormant—when every hundred plants then destroyed means a thousand less in the following year. The technical part would be in preventing cleaned districts from again becoming infected, which would mean labour lost, as the red spider cannot be trusted to do the work."

DESTRUCTION OF THE WATER HYACINTH BY A CHEMICAL PROCESS.

Some time ago a gentleman came to Queensland from the United States, where he had been engaged in the destruction of the hyacinth, hoping to be able to destroy the prickly pear by means of a chemical which had been successfully employed against the aquatic pest. No success attended his experiments on the pear, and nothing more was heard from our visitor. About that time a method, which appeared to have

SOLVED THE PROBLEM,

was being tried on the St. John's River. This was by means of a chemical, which had such an effect upon the plant that if it came in contact with the

stem or blossoms these soon withered. So powerful was the solution that, it was said, it worked its way down the stem, killing the root as well. It is unfortunate that the inventor kept the main ingredients of the compound a secret, but it is known that a large quantity of acid was used in the preparation. The process of manufacture was very simple, the "laboratory" being placed on a barge provided with two large tanks, each of which had a capacity of 5,000 gallons. Connected with the tanks was a boiler, in which the ingredients were mixed at a high temperature produced by steam heat. The barge was of such light draft that it could be towed by the spraying boat if desired, but the latter was provided with three reservoirs, each holding 3,500 gallons, which were filled by pumping from the barge. Pipes led from the reservoir to a steam pump, which supplied the spraying apparatus. This consisted of three booms. One extended directly in front of the vessel, being supported by a block and tackle attached to the bow deck. The others projected from the sides of the vessel. The sprayers consisted of hollow tubes, which were perforated at intervals of about 1 foot, and the holes were fitted with miniature nozzles. The liquid was forced into the sprayers through lines of hose, which were connected to the sprayers by couplings in the usual manner. The arrangement of the sprayers was such that the chemical could be distributed over a space of 90 feet in width when the boat was moving. The boat containing the spraying apparatus was of the type of craft used on Southern rivers, drawing but 4 or 5 feet of water. She was provided with very powerful engines in proportion to her size, in order to drive her through the masses of hycainth, and was so modelled as to offer as little resistance to the obstruction as possible. The reservoirs carried a sufficient supply of chemical to cover about 100,000 square yards, and on a portion of the stream where the growth was not too rank the steamer could treat that area of surface in a day. In places where the side-sprayers could not be utilised on account of trees, snags, or other obstructions, the chemical was applied to the plants by means of ordinary hose operated by the crew.

Such was the destructiveness of the solution that, within a few hours after it was applied the withering process began, and microscopic tests proved that the liquid penetrated the growth below the water, killing the roots, as already stated. Portions of the dead growth pulled from the bottom of the St. John's River, where the treatment had been applied, showed that the effect of the chemical was to rot the fibre and disintegrate it to such an extent that it no longer offered resistance to navigation.

The solution killed the seed as well as the plant, and efforts were made to cover as much space as possible during the seeding period. The work was carried out under the direction of the United States engineers. No further news has reached us concerning this work, and we can, therefore, only assume that if not exactly a failure, it was not such a splendid success as to induce any smart American to offer to clear the plant from the Queensland watercourses, for which work, doubtless, he would have reaped a substantial reward.

Water Hyacinth as a Fodder.

We have noticed cattle standing in hyacinth-infested waterholes and eating the leaves, but we are not aware of any Queensland cattle-owners who have made a systematic trial of the plant as a fodder for stock. But it seems that elsewhere it is appreciated for the purpose. "Amateur Gardening" says:—"The water hyacinth is not a native of Florida, but was introduced there about the year 1800 from Venezuela. It is still a great nuisance, but it has been proved to be excellent fodder for cows, so that farmers are filling useless ponds and lakes with the plant, as 1 acre of water covered with the water hyacinth is equal in value to 5 acres of the best grass."

In this State, we should prefer 1 acre of paspalum or lucerne to 100 acres of hyacinth for milk production.

BANANA FIBRE EXTRACTING MACHINE.

We have been informed that a machine for extracting banana fibre has been invented and patented in New York by Mr. C. E. Dailey. The weight of the machine, which is driven by hand, is 172 lb., and it is reported to produce 125 lb. of fibre per day.

SHIPMENT OF CHEESE.

The ss. "Devon" took away last month the largest shipment of cheese ever exported from Queensland.

Messrs. Birt and Co., Limited, have been working for some time with the object of getting their principals to provide special chambers in their steamers for the carriage of cheese, and the firm has now arranged for more space for this class of cargo. Another big shipment is expected to be made to London in the ss. "Somerset," to leave Brisbane early this month (April).

AUSTRALIAN WHEAT CROP FOR 1906-7.

The estimated Australian wheat crop of 81,000,000 bushels for 1906-7 is 23,000,000 bushels more than last season, and nearly 7,000,000 bushels above the record of 1903-4. Assuming that the present wheat prospects are realised, the total value of crop, as set out above, at the seaboard would be over £12,000,000. It would represent 2,170,000 tons, and allowing for the quantity required for food and seed in the Commonwealth, would leave over 1,400,000 tons, representing cargo for about 600 sailing ships, as a surplus for export.

THE TREWHELLA STUMPING JACK.

The great lifting power of this handy little implement is well exemplified in the accompanying illustration. Most people who have lived long in Brisbane will remember a magnificent Moreton Bay fig-tree which for a number of years flourished in William street, next to the Government Printing Office. The building of new premises on this ground necessitated the removal of this grand relic of the past. The butt was 18 feet or more in circumference, and its huge branches overhung the entire frontage. To facilitate the extraction of the tree, one of the Trewhella jacks was used, and in a very short space of time the huge monster was overthrown. Hundreds of these machines are now being used all over the States of the Commonwealth, and Messrs. Trewhella Brothers have been compelled to enlarge their premises at Trentham, and work day and night to cope with the demand for "Monkey" and "Wallaby" jacks.

TO PRESERVE CUCUMBERS.

Choose the small straight ones, and, of course, young ones; the greenest and those free from seeds are best. Green them as follows:—Place them on vine leaves, and cover them with the leaves in a preserving pan with spring water to cover them, and lid the pan tightly; set them near the fire, and when they begin to simmer remove. Pour off the water, and if not green put fresh leaves when they are cold, and repeat the same. Take them out carefully with a slice. When cold take 1 lb. of best lump sugar and ½ pint of water, and set it over the fire. When it simmers, skim it clear; put in the rind of a lemon shred as fine as straws and ½ oz. of ginger. When the syrup is pretty thick remove the pan; when the syrup is cold wipe the cucumbers quite dry and put them into it. Boil the syrup once in three days, and when cold pour it again over the cucumbers; do this for three weeks, but remember to strengthen the syrup if required. The danger of spoiling them is at first.

Plate XIV.

Fig-tree Extracted by the Trewhella Monkey Jack.

THE TREATMENT OF MANGE.

There are constant inquiries about the best treatment of mange. Dalziel, in his book on "Diseases of Dogs," says, with regard to mange:—The first thing to be done with a mangy dog is to wash him. Let him have a good scouring and scrubbing with soft soap and fairly hot water; dry well with a soft cloth, which should be immediately well boiled. Then dress the dog with the following lotion: Take flowers of sulphur 2 lb., unslaked lime 1 lb., water 2 gallons. Slake the lime in a small portion of the water, stir in the sulphur, adding water gradually until it is of creamy consistence, then add the remainder of the 2 gallons and boil down to 1 gallon. Let it stand till cold, pour off the clear liquid and make the quantity in five parts with cold water. Another excellent preparation is:—Olive oil 1 pint, oil of tar 4 oz., sulphur 4 oz. This dressing should remain on the skin for one week, then be washed off with hot water and soap, to which has been added a little soda. It should be repeated in 24 hours. In using either of these lotions, all the affected parts should be freely wetted. Chronic cases often take a month or two to cure.

Times of Sunrise and Sunset, 1907.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·56	6·45	5·20	6·42	5·40	6·21	5·57	5·47
2	4·57	6·46	5·21	6·42	5·41	6·20	5·58	5·46
3	4·58	6·46	5·22	6·41	5·42	6·19	5·58	5·45
4	4·58	6·46	5·23	6·41	5·42	6·18	5·59	5·44
5	4·59	6·47	5·24	6·40	5·43	6·17	5·59	5·43
6	5·0	6·47	5·24	6·39	5·43	6·16	6·0	5·42
7	5·1	6·47	5·25	6·39	5·44	6·14	6·0	5·40
8	5·1	6·47	5·26	6·38	5·44	6·13	6·1	5·39
9	5·2	6·47	5·26	6·38	5·45	6·12	6·1	5·38
10	5·3	6·47	5·27	6·37	5·46	6·11	6·2	5·37
11	5·3	6·47	5·28	6·36	5·46	6·10	6·2	5·36
12	5·4	6·47	5·29	6·35	5·47	6·9	6·3	5·35
13	5·5	6·47	5·29	6·35	5·47	6·8	6·3	5·34
14	5·6	6·47	5·30	6·34	5·48	6·7	6·4	5·33
15	5·7	6·47	5·31	6·33	5·48	6·6	6·4	5·32
16	5·7	6·47	5·32	6·32	5·49	6·5	6·5	5·31
17	5·8	6·47	5·32	6·31	5·50	6·4	6·5	5·30
18	5·9	6·47	5·33	6·31	5·50	6·3	6·6	5·29
19	5·10	6·47	5·34	6·30	5·51	6·1	6·7	5·28
20	5·11	6·47	5·34	6·29	5·51	6·0	6·7	5·27
21	5·11	6·46	5·35	6·28	5·52	5·59	6·8	5·26
22	5·12	6·46	5·36	6·27	5·52	5·58	6·8	5·25
23	5·13	6·46	5·36	6·26	5·53	5·57	6·9	5·24
24	5·14	6·45	5·37	6·25	5·53	5·56	6·9	5·23
25	5·15	6·45	5·38	6·24	5·54	5·55	6·10	5·22
26	5·15	6·45	5·38	6·23	5·54	5·54	6·10	5·21
27	5·16	6·44	5·39	6·23	5·55	5·53	6·11	5·20
28	5·17	6·44	5·40	6·22	5·55	5·51	6·11	5·19
29	5·18	6·44	...	...	5·56	5·50	6·12	5·19
30	5·19	6·43	...	...	5·56	5·49	6·12	5·18
31	5·20	6·43	...	...	5·57	5·48	...	...

Phases of the Moon.

Date	Phase	H. M.
8 Jan.	☽ Last Quarter	0 47 a.m.
14 „	● New Moon	3 57 p.m.
21 „	☾ First Quarter	6 42 „
29 „	○ Full Moon	11 45 „
6 Feb.	☽ Last Quarter	10 52 a.m.
13 „	● New Moon	3 43 „
20 „	☾ First Quarter	2 35 p.m.
28 „	○ Full Moon	4 23 „
7 Mar.	☽ Last Quarter	6 42 p.m.
14 „	● New Moon	4 5 „
22 „	☾ First Quarter	11 10 a.m.
30 „	○ Full Moon	5 44 „
6 April	☽ Last Quarter	1 20 a.m.
13 „	● New Moon	5 6 „
21 „	☾ First Quarter	6 38 „
28 „	○ Full Moon	4 5 p.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1907.	Rockhampton.		Townsville.		Cooktown.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
January	18 m.	2 m.	42 m.	12 m.	53 m.	9 m.
February	15 m.	5 m.	36 m.	18 m.	44 m.	18 m.
March 1 to 20 ...	11 m.	9 m.	29 m.	25 m.	35 m.	27 m.
„ 21 to 31 ...	9 m.	11 m.	28 m.	26 m.	29 m.	33 m.
April	m.	13 m.	20 m.	34 m.	21 m.	41 m.

Answers to Correspondents.

PIGEON PEA.

E.L.M., Roma.—

We would not advise you to plant the Pigeon Pea as food for stock. No doubt the cattle will eat it greedily, but, unless fed in moderation, all such peas are dangerous. Some years ago it was grown at the Agricultural College by Professor Shelton, but he discarded it after the first year, and a trial of it as silage proved its uselessness for that purpose. Sown thickly and rolled down before the plants reach the woody stage, they form a splendid green manure crop.

COST OF PREPARING COFFEE FOR MARKET.

J. WILSON, North Coast Line.—

The cost of growing and preparing coffee for market depends greatly on the seasons, the machinery employed, and the cost of labour. On an average, the cost in North Queensland is as follows:—

		s.	d.
Picking—100 lb. per day, at 2d. per 5 lb.	... ...	3	4
80 lb. per day, at $2\frac{1}{2}$d. per 5 lb.	... ...	3	4
65 lb. per day, at 3d. per 5 lb.	... ...	3	3

The average cost of picking is $\frac{1}{2}$d. per lb., which brings parchment coffee to $2\frac{1}{2}$d. per lb.

Milling to remove parchment and silver skin, and produce a marketable coffee, including cost of picking, 3d. per lb.

On the Lower Russell Coffee Plantation, the picking price was 1d. per 3 lb. Hulling, $\frac{1}{2}$d. per lb.

The loss from parchment to clean coffee is estimated at 25 per cent.

1 lb. of ripe cherry will yield $2\frac{4}{5}$ oz. of clean coffee, or $17\frac{1}{2}$ per cent.; and two bags of dry parchment are equal to one bag of clean coffee.

SICKNESS OF A COW.

C. E. WILSON, Moggill.—

Question: Mr. Wilson writes:—I had a cow ailing for the last six months, but only a month ago serious symptoms set in. She went off her food, became thin, and seemed stupid about the head. She would go round and round sideways for an hour at a time, and, when she stood still, she turned her head round to her ribs on one side or the other. Thinking something was wrong with her head, I killed her. On opening her, I found all her organs in a perfectly healthy condition, but when I opened the stomach I saw hundreds of live, fleshy-looking insects adhering to it in various stages. The largest were about $\frac{1}{2}$-inch long. They seemed larger at one end than at the other. Kindly inform me through the Journal what they are, the cause and cure.

Answer:—Mr. A. H. Cory, M.R.C.V.S.L., Veterinary Surgeon to the Department of Agriculture and Stock, says, in reply to your questions as to cause of death of your cow:—

1. The parasites you found in the stomach are called "Amphistoma Conicum." They are common in cattle, and do little or no harm.

The cause of sickness in the cow was not the harmless insects, but evidently an affection of the brain, probably some "hydatid."

Treatment would have been of very little service.

This brain affection is common in pigs and dogs, but very rare in cattle.

APHIS AND SCALE INSECTS ON CITRUS TREES.

Mrs. M. Bugden, Mullet Creek.—

Mr. H. Tryon, Government Entomologist, in reply to your inquiry in your letter of 13th February, writes:—

It is a matter of interest to learn from Mrs. Bugden, of Mullet Creek, of her experiences in coping with Black Pest (? Aphis) and scale insects attacking citraceous trees, by aid of milk and lime. The use of lime in this way is not quite a novel one, but orchardists usually regard other mixtures more reliable for subduing the injurious insects of the orange.

The insects derived from the two kinds of caterpillars found feeding upon the grape vine are—(1) the Brown Hawk Moth, and (2) parasitic flies attacking the Swift-flying Hawk Moth.

A caterpillar under ordinary conditions produces in the course of its natural development either a butterfly or a moth. Should it give rise to flies, either two-winged or four-winged ones, there is evidence, afforded by this fact, that such caterpillar has been stung by a parasitic fly, and eggs have been deposited by the latter within its tissue, to give rise in the first place to tiny grubs, and thereafter to flies similar to the one that has occasioned the injury.

The caterpillars so destructive to the white crocuses have again been victimised by parasites, and so, instead of turning into moths, have yielded "a number of little flies." In many instances these flies closely resemble in appearance either house flies or meat flies, and can alone be distinguished from these by features difficult for the ordinary person to recognise. There are many instances of birds avoiding gaily-coloured or brightly-marked caterpillars. In fact, it is the rule, for these features are associated with the possession of noisome body juices.

RHODES GRASS.

F.W.A., Warwick.—

A valuable grass for dairy purposes. The manager of the Wollongla Experiment Farm, N.S.W., who has thoroughly tested it, speaks highly of it as a dairy grass. It is doing well wherever planted in coastal Queensland, and will stand hot, dry weather better than *Paspalum dilatatum*, as has been proved at the Biggenden State Farm.

A plot, growing near Murphy's Creek, has made very rapid growth, and gives great promise of being one of our best grasses. It spread rapidly, and all kinds of stock are fond of it. It makes an excellent hay. It thrives in all kinds of land, from poor thin soils to the richest of scrub, and it will undoubtedly do well in the Killarney scrubs.

QUININE BARK.

Some time ago a sample of bark was sent to us from one of our correspondents on the Barron River. Owing to our long absence in Victoria, the sample was overlooked until lately. We regret that the delay should have occurred. Mr. J. C. Brünnich, Agricultural Chemist, had the bark examined in his laboratory, and he reports that it does not contain any quinine. The bitter taste, which is not marked, is more probably due to the presence of glucoside.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	MARCH. Prices.
Apples, Eating, per packer, Hobart	6s. to 8s.
Apples, Cooking, per packer, Hobart	6s. to 7s. 6d.
Apples, Victorian, per packer	7s. to 7s. 8d.
Apples, Local, Cooking, per packer	6s. 6d. to 8s.
Apricots, Local, per packer	3s. to 6s.
Bananas, Local, per dozen	1d. to 1¼d.
Bananas, Local, per bunch	6d. to 9d.
Bananas, Fiji, per case	11s. 6d. to 12s. 6d.
Cherries, quarter-case	2s. 6d. to 5s. 3d.
Cape Gooseberries, per quart	6d. to 6½d.
Grapes, per lb.	1½d. to 2d.
Lemons, New South Wales, per case	7s. to 10s.
Lemons, Local, per case	7s. to 8s.
Mandarins	...
Mangoes, per case	...
Nectarines, per quarter-case	2s. 9d. to 3s. 5d.
Oranges, Local, per packer	...
Papaw Apples, per case	5s.
Passion Fruit, per quarter-case	1s. 6d. to 2s.
Peaches, per case	4s. 6d. to 6s.
Peanuts, per lb.	2½d.
Pears, Imported, per case	6s. to 10s.
Persimmons, per case	3s. to 4s.
Pineapples (rough leaf), per dozen	9d. to 1s.
Pineapples (smooth leaf), per dozen	1s. 6d. to 2s. 3d.
Plums, quarter-case	2s. 6d. to 3s. 6d.
Rockmelons, per dozen	6d. to 2s.
Strawberries, per tray	1s. to 2s. 6d.
Tomatoes, per quarter-case	1s. to 2s.
Watermelons, per dozen	3s. 6d. to 8s.
SOUTHERN FRUIT MARKET.	
Apples, per case	5s. to 7s.
„ Tasmanian, per case	8s. to 10s.
Apricots, per gin case	2s. 6d. to 6s.
Gooseberries, per quarter-case	3s. to 3s. 6d.
Grapes	2s. 6d. to 4s. 6d.
Strawberries, per dozen punnets	4s. to 6s. 6d.
Bananas, Queensland, per case	9s. 6d. to 10s. 6d.
„ „ per bunch	2s. 6d. to 4s.
„ Fiji, per case	13s. 6d. to 14s. 6d.
„ „ per bunch	4s. to 7s.
Chillies, per bushel	6s.
Lemons, Ordinary, per gin case	2s. 6d.
„ Medium to good, per gin case	2s. to 4s. 6d.
„ Extra choice „ „	7s. to 8s.
Peaches, per box	to 5s.
Oranges, medium to extra choice, per case	14s. to 20s.
Pineapples, per case	2s. to 4s.
„ choice, per case	4s. to 5s.
„ small „	2s.
Passion Fruit, per gin case	1s. 6d. to 5s.
Watermelons, Queensland, per dozen	...
„ medium	...
„ small, from	...
Tomatoes, Queensland, choice, per quarter case	2s. 6d. to 3s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH.

Article.		MARCH. Prices.
Bacon (Pineapple)	lb.	8d. to 9½d.
Barley (Malting)	...	...
Bran	ton	£3 12s. 6d. to £3 15s.
Butter, Factory	lb.	9½d.
Chaff, Mixed	ton	£3 to £4.
Chaff, Oaten	"	£3 17s. 6d. to £4.
Chaff, Lucerne	"	£3 to £3 15s.
Chaff, Wheaten	"	£2 10s.
Cheese	lb.	5½d. to 6d.
Flour	ton	£7 15s. to £8.
Hay, Oaten	"	£4 15s. to £5.
Hay, Lucerne	"	£2 12s. 6d. to £2 15s.
Honey	lb.	1½d. to 2½d.
Maize	bush.	2s. 2½d. to 2s. 4d.
Oats	"	2s. 9d. to 2s. 11d.
Pollard	ton	£4 to £4 7s. 6d.
Potatoes	"	£1 15s. to £5 3s. 4d.
Potatoes (Sweet)	"	...
Pumpkins	"	...
Wheat, Milling	bush.	3s. to 3s. 2d.
Wheat, Chick	"	2s. 3d. to 3s.
Onions	ton	£4 to £4 15s.
Hams	lb.	10d. to 10½d.
Eggs	doz.	6¾d. to 1s. 2d.
Fowls	pair	2s. 3d. to 3s.
Geese	"	...
Ducks, English	"	2s. 1½d. to 3s. 1d.
Ducks, Muscovy	"	2s. 9d. to 3s. 7d.
Turkeys, Hens	"	4s. 7d. to 6s. 6d.
Turkeys, Gobblers	"	8s. 1d. to 10s.

ENOGGERA SALEYARDS.

Animal.	FEBRUARY. Prices.
Bullocks	£10 to £11 2s. 6d.
Cows	£7 10s to £9.
" (Extra Heavy)	£11.
Merino Wethers	20s. 9d.
C.B. "	23s.
Merino Ewes	17s. 9d.
C.B. "	17s. 9d.
Lambs	16s. 3d.
Pigs (Baconers)	38s.
" (Porkers)	30s.

Farm and Garden Notes for May.

FIELD.—During this month the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now in this work. Potatoes should be hilled up. Cut tobacco. The last of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Growers are notified that cotton-ginning machinery has been installed by Messrs. Kitchen and Sons, in the Valley, Brisbane, so that a sure means of disposing of the crop is available (*see* Journal of 1st March, 1906). Every effort should be made to ensure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to the climate and to their particular district and soil. A few acres of artificial grass will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass in the West, as has been proved at Barcaldine, will carry ten or twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Hautbois, and Trollope's Victoria. The Aurie is the earliest, and the Marguerite next. In some localities, strawberry planting is finished in March, and the plants bear their first fruits in August. In others, fruit may be gathered in July, and the picking does not end until January.

KITCHEN GARDEN.—Onions which have been planted in seed beds may now be transplanted. The ground should have been thoroughly cleaned, pulverised, and rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather, plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus. Full instructions for the successful cultivation of this valuable vegetable will be found in the February issue of the Journal, 1906.

FLOWER GARDEN.—Transplanting and planting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, penstemons, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs, such as anemones, ranunculus, snowflakes, freesias, ixias, iris, narcissus, &c. Tulips and hyacinths may be tried, but success in this climate is very doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching and keep the walks free from weeds. Clip hedges and edgings.

Orchard Notes for May.

By ALBERT H. BENSON.

The hints given in the notes for March and April on the gathering, handling, and marketing of citrus fruits apply equally to the present month, with this difference, however, that even more care is required, as the riper citrus fruits become, the more readily are they bruised and injured. May being usually a more or less dry month on the coast, the opportunity should be taken of cleaning up all weeds and rubbish that may have accumulated during the summer and autumn, and getting the surface of the land into a good state of cultivation, so that the comparatively small rainfall of the winter months may be conserved in the soil for the trees' growth. Unless this is done, fruit trees, especially citrus, are apt to suffer, especially if growing on shallow or badly drained soil with a retentive subsoil. Where not already done, all dead or worthless trees should be dug out; and if fresh trees are to be planted in the same place, then the holes from which the trees have been taken should be allowed to remain open, and the soil should be well exposed to the action of the atmosphere and be well smeetened. Land intended for planting during the winter should be got ready, more especially if it is new land, as it is a mistake to delay the preparation of the land too much, or to plant the trees in a raw, unsweetened, and improperly prepared land. What planting has to be done, see that it is done well, as an acre of land properly prepared will pay better than twice or three times that quantity treated anyhow.

Towards the end of the month, slowly soluble manures, such as boiling-down refuse or coarse bones, may be applied to the land, as they will become slowly available; and when the spring growth starts, the trees will get the benefit. Quickly soluble manure should not be applied now, but should only be used during a period of active plant growth, otherwise they are apt to be lost. Where possible, don't destroy the weeds and refuse of an orchard unless the same is diseased, or is likely to form a harbour for injurious insects, but rather form it into a compost heap, preferably with lime, and allow it to become well rotten, when it will be found to be a valuable manure for citrus and other trees in many soils; as, though our soils, as a rule, are great producers of weeds, many are actually deficient in vegetable matter, so that it is a mistake to burn off all weeds, grass, or other rubbish. This deficiency of organic matter in the soil is a serious consideration, as soils deficient in organic matter are usually deficient in nitrogen, and also they are deficient in the power to retain moisture—a matter of extreme importance in a country like this, where we are subject to such long spells of dry weather.

In the colder districts the pruning of deciduous trees may be commenced towards the end of the month, but in other parts of the State it is better to wait longer, as the leaves are not off and the sap is not down. Pineapples, where at all subject to frost, should receive a light covering of grass or other similar material as a protection, or, where practicable, as in the case of scrub lands, subject to light frosts, they should be covered with a light framework covered with palm leaves or similar material.

Palm stems or saplings resting on forked posts, placed on either side of the bed to be protected, make a good framework; and with palm-leaves, tea-tree bush, or other similar material laid across from sapling to sapling, a very cheap and efficient protection against frost is obtained.

Gather and destroy all infested guavas, oranges, custard apples, &c., so as to destroy the larvæ of any fruit flies or peach moths that may be in them, as if these insects are well killed down now there will be many less to deal with next spring, and there is a chance of the earlier fruits being harvested without much loss.

Agriculture.

THE AUSTRALIAN WHEAT CROP.

While the wheat crop has not realised the sanguine expectations of the early part of the season, it must not be forgotten that only on two previous occasions was it exceeded since cultivation became general in Victoria. The first occasion was in the season of 1903-4, immediately following the great drought. That season the yield was 28,525,579 bushels, with an average of 14·49 bushels per acre; while in the previous season—namely, 1902-3, the yield was only 2,569,364 bushels, an average of only 1·29 bushels for the area sown. It seems hardly credible that there could be such a difference between two seasons immediately following each other. The next best yield was in 1905-6, when the wheat crop amounted to 23,417,670 bushels, or 11·31 bushels per acre. The following table shows the official figures for the last ten years:—

	Area under Crop. Acres.	Gross Yield. Bushels.	Average per Acre. Bushels.
1897-1898	1,657,450	10,580,217	6·38
1898-1899	2,154,163	19,581,304	9·09
1899-1900	2,165,693	15,237,948	7·04
1900-1901	2,017,321	17,847,321	8·85
1901-1902	1,754,417	12,127,382	6·91
1902-1903	1,994,271	2,569,364	1·29
1903-1904	1,968,599	28,525,579	14·49
1904-1905	2,277,537	21,092,139	9·26
1905-1906	2,070,517	23,417,670	11·31
1906-1907	2,031,893	22,618,043	11·13

The seed and food requirements of Victoria for 1907 are estimated at 8,315,000 bushels, and, deducting this amount from the total yield, a surplus is left of 14,303,000 bushels. Of this surplus, about 6,300,000 bushels have already been shipped between the middle of December and the middle of March, leaving about 8,000,000 still on hand. The value of the exportable surplus of 14,303,000 bushels may be roughly estimated at over £2,000,000 sterling. However, farmers are not evincing any great desire to rush their wheat on to the market. A large majority have got over the financial straits resulting from the drought, and they are in a position to hold their grain. The South Australian wheat harvest has been estimated at nearly 20,500,000 bushels. The official estimate of the New South Wales crop is a little over 24,000,000 bushels, but this is generally regarded as excessive. Adding Queensland, Western Australia, and Tasmania, the total Australian wheat crop this season may be reckoned at 67,000,000 to 68,000,000 bushels, as against 68,500,000 bushels for 1905-6, 54,500,000 bushels for 1904-5, and 74,000,000 bushels for 1903-4.—"Australasian."

WOOLPACKS.—AN IMPORTANT MATTER.

A Blenheim correspondent writes:—"It has been pointed out to me that the woolgrowers of New Zealand are losing between £15,000 and £20,000 a year through the inadequate quality of the woolpacks with which they are supplied from Calcutta. Probably not one in a thousand knows that such is the case, but the explanation is very simple, and will be readily seen. Recently

the price of jute, which is the main material in woolpacks, rose very high, and coincidentally the manufacturers at Calcutta began turning out an article of poorer quality. Careful tests made by some woolgrowers here showed that for some time past the average of woolpacks has been 8 lb., and it is confidently believed that such would be found to be the case all over the colony. Now, as the recognised standard is 8¾ lb., it requires ¾ lb. additional wool in every bale to make up the aggregate weight. On present prices, ¾ lb. of wool is worth 9d., and if another penny is added for freight the loss mounts up to 10d. The rest is a matter of arithmetic, the result being obtainable by multiplying last year's exportation of bales of wool by 10d. The 1906 output of wool represented over £6,000,000, and £17,000 is comparatively small, but it is nevertheless worth looking after. Three thousand bales mean £150. The question is whether manufacturers can be made to bring the quality of woolpacks up to a recognised standard. Mr. R. B. Walker, of Langridge Station, who is chiefly responsible for pointing out the discrepancy, speaks with some expert knowledge, for he was at one time engaged in the jute manufacturing industry at home, and knows an inferior quality woolpack when he sees it. Another aspect is that the loss to growers assumes still greater proportions if the risk of damage and deterioration to which wool is submitted on account of flimsy packing is also considered."—"Farmers' Union."

A CHEAP CANNING OUTFIT.

The canning of fruit has now become a recognised and profitable industry in most fruit-growing countries, and of late years the tendency has been to greatly simplify and cheapen the process.

Bulletin 81 of the Louisiana Experiment Station describes one such simple process, for which the cost of outfit is only about £2, having a capacity of 300 2-lb. cans and 200 3-lb. cans per day.

The details observed in the canning of tomatoes with this outfit are thus stated by the station:—

In canning tomatoes, the first step is to scald the fruit just sufficiently to loosen the skin, so that it can be slipped off. To do this, we use a large iron kettle, commonly called a "wash-pot." The tomatoes are placed in a cheap tin vessel, holding about ⅓-bushel, that has been punched full of small holes, and dipped into the boiling water and allowed to remain about one minute, or until the skin will slip readily. The fruit is then peeled, sliced, and filled directly into the empty cans. The cans must be well filled for good results. This finishes the first step. The filled cans are then passed to the second stage of the operation. The tops of the cans wiped dry with a clean cloth, the cap placed on and soldered around the rim, the small hole or vent in the centre of the cap being left open. Then we are ready for the third step, that of exhausting—expelling the air from the cans. This is accomplished by submerging the cans in the boiling water (in the boiler) about two-thirds of their length. They are held there until they come to a boil, or, for tomatoes, ten minutes. They are then removed, the small hole in the centre of the top is closed with solder, and the cans are then completely submerged in the boiling water and boiled, or processed, twenty minutes, which is the fourth and last step in the operation.

The following vegetables and fruits can be successfully canned in a somewhat similar manner:—French beans, asparagus, cauliflowers, strawberries, blackberries, raspberries, peaches, pears, plums, cherries, apples, figs, &c. Corn and peas cannot be successfully preserved by this method, unless the cans are processed for three and a-half to four hours. But even then there will be many losses from swelled and spoiled cans.—"Cyprus Journal."

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 31ST MARCH, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Poppie ...	Guernsey-Jersey	24 Feb., 1907	956	3·8	40·47	
Blank ...	Jersey-Ayrshire	4 Feb. ,,	794	4·4	39·21	
Cocoa ...	Jersey	13 Dec., 1906	752	4·3	36·26	
Count ...	Shorthorn ...	20 Nov. ,,	728	4·4	35·95	
Grace ...	South Coast ...	28 Jan., 1907	770	3·9	33·51	
Nell ...	Shorthorn ...	25 Jan. ,,	704	4·2	33·12	First calf
Whitefoot ...	Holstein Sh'rth'rn	7 Nov., 1906	773	3·8	32·72	
Dripping ...	,, ,,	28 Nov. ,,	766	3·8	32·43	
Gin ...	Shorthorn ...	1 Jan., 1907	678	4·2	31·89	
Wonder ...	,, ...	7 Dec., 1906	691	4·2	32·50	First calf
Linda ...	Ayrshire ...	12 Nov. ,,	696	4·0	31·10	
Careless ...	Jersey	2 Nov. ,,	687	4·0	30·70	
Reanie ...	Holstein Sh'rth'rn	5 Sep., 1905	423	6·4	29·85	19th month of milking
Ivy ...	Jersey	17 Jan., 1907	649	4·1	29·76	
Winnie ...	Shorthorn ...	11 Sept., 1906	647	4·1	29·67	
Carrie ...	Jersey	3 Dec. ,,	614	4·3	29·61	
Cheerful ...	Shorthorn ...	17 Feb., 1907	729	3·6	29·16	
Mona ...	Holstein Sh'rth'rn	16 Jan., 1906	594	4·2	27·93	15th month of milking
Cuckoo ...	Jersey	27 Dec. ,,	613	4·0	27·39	
Blanche ...	Ayrshire ...	18 Nov. ,,	565	4·3	27·24	
Friz ...	Shorthorn ...	30 Oct. ,,	643	3·8	27·22	
Honeycomb	,, ...	19 July ,,	562	4·3	27·09	
Chocolate ...	,, ...	5 Mar., 1907	717	3·4	26·98	Yield recorded from 10th March — 22 days' milking recorded
No. 48 ...	Ayrshire Sh'rth'rn	30 Nov., 1906	658	3·6	26·32	
Rhubarb ...	Ayrshire ...	18 Jan., 1907	620	3·8	26·25	First calf
Glen ...	Shorthorn ...	6 Feb., 1906	422	5·4	25·52	First calf
Butter ...	,, ...	11 Aug. ,,	554	4·1	25·41	
Haze ...	Ayrshire Sh'rth'rn	16 Aug. ,,	513	4·4	25·33	
Rennet ...	Holstein—Grade Holstein	20 Oct. ,,	518	4·4	25·58	First calf
Restive ...	Shorthorn ...	3 Aug. ,,	524	4·3	25·26	Second calf
Lady Rose ...	Guernsey ...	10 Jan., 1907	412	5·4	24·92	

N.B.—All cows grazed on natural pasture. No hand-feeding.

THE DAIRY HERD AT THE QUEENSLAND AGRICULTURAL COLLEGE.

The fame of the College Ayrshires has not gone unnoticed by the British rural journals. The following occurs in the "Farmer and Stockbreeder" for February last:—

DAIRY BREEDS IN QUEENSLAND.

At the Queensland Agricultural College, after a thorough investigation, the palm for dairy cows has gone to the Ayrshires. The Shorthorns yielded large quantities of milk during the early period of lactation, but went off quickly. The Holsteins proved excellent animals for the dairy, although they are heavy beasts, but rough it well under unfavourable conditions. Some of

the worst cows at the college were crossed with Holsteins, and in every case good milkers resulted. From returns compiled from a few of the best cows, during a period of five to six years, including the droughty period, each produced a butter value of over £55, and the progeny £60. In the estimate no deduction is made for labour or food. One of the best yields was by the Ayrshire cow Jeanie, which gave 695·99 lb. butter in 823 days, or an average of 0·85 lb. daily. The grade Jersey cow Pansy yielded 900·48 lb. butter in 1,009 days, or an average of 0·89 lb. daily. The Holstein-Shorthorn cow Mona yielded 1,246·96 lb. butter in 1,231 days, or a daily average of 1·01 lb. Even this was beaten by the Ayrshire cow Lavinia, which produced 1,475·31 lb. butter in 1,447 days, or a daily average of 1·02 lb.

STREAKS IN BUTTER.

Streaks in butter, according to the New York Agricultural Experimental Station authorities, are due to the presence of butter-milk after the salt was been added, and not to the ancient notion, the imperfect working of salt in the butter. The fact that when butter was not salted there were no mottles has promoted an erroneous conclusion. Still, it is true that when butter is not salted there will never be any streaks in that butter, even if there is an excess of butter-milk present in the butter after being washed; but should salt be added to the butter while it is in that condition there will surely be streaks, and no amount of extra working will take those streaks out. If the butter-milk is all washed out of the butter, and any amount of salt is added afterwards, and not worked in evenly, there will not be any streaks. This goes to show that salt is not the direct cause of mottles in butter, although it has an indirect effect in producing them.

BANANAS IN THE CANARY ISLANDS.

The "Coloniser" for December quotes from Brown's Guide the following particulars as to the cultivation of bananas in the Canary Islands:—

Bananas in the Canaries only grow on irrigable land up to an altitude of about 8,000 feet. They are shipped more especially from Grand Canary. Land planted with bananas takes about eighteen months to come into bearing. Later on it gives fruit about once a year. The roots should be planted about 7 feet apart, in rows about 9 feet apart. This gives about 780 plants to the acre, or about 920 to the Canary fanegada. New land planted with old trunks will give fruit at from four to six months earlier than similar land planted with suckers.

The first harvest consists of one bunch to the plant, which is then cut down. In the meantime, several suckers spring up. These should be reduced to not more than three. An acre of land may thus, under favourable circumstances, produce 2,340 bunches a year. At 1s. 6d. a bunch all round—not a high estimate—this gives £175 a year gross. Expenses consist of a little labour, plenty of water, and some manure (generally chemical).

The age of a plantation is probably limited to from nine to sixteen years, after which the fruit deteriorates. From its actual duration, one year and a-half must be deducted. The annual result when in bearing is, therefore, rather larger than the actual mean yield. When fairly started, a banana plantation gives little trouble, but the plant is rather difficult to kill when it is necessary to clear the ground for other crops. The leaves rot slowly, but form a good manure, or they are used for packing. The stems serve as fodder for cows.

The Horse.

AGE OF A HORSE AS INDICATED BY THE TEETH.

Of the Temporary or Milk Incisors.

The foal is born with his teeth in a rudimentary state in the gums. At various periods during the first ten months the different temporary incisors appear, as shown on page 224, Fig. 0. Under one year old the foal is also clearly distinguished by a woolly tail.

The yearling is complete in all six incisors, but several well-marked signs distinguish his mouth from that of the two-year-old. The teeth at this period show but little signs of wear. The corner teeth are mere shells, having no inner walls, and all the teeth are in close juxtaposition. (Fig. 1.)

At two years old, the inner wall of the corner teeth has grown up level with the outer wall. The centre teeth show considerable signs of wear, and indeed all the teeth appear somewhat smaller than they did in the yearling. They also stand somewhat wide apart at their necks on account of the gradual growth of the jaw in width. (Fig. 2.)

Inexperienced persons have been known to mistake a two-year-old for a five-year-old mouth. But the difference in the conformation of the animal, as well as of milk and permanent teeth, ought to make such a mistake impossible.

Development of the Permanent Teeth.

A few months before three years old, the horse sheds the two centre milk teeth, which are replaced by permanent. Thus the jaw contains at three years old two centre permanent teeth and two milk teeth on each side. (Fig. 3.)

A few months before four, the horse sheds the two next milk teeth, which are replaced by permanent. Thus the jaw now contains four permanent and one milk tooth on each side. (Fig. 4.) The appearance of the mouth when closed, and also the mode in which the teeth meet, are shown in Fig. 4*a*. This figure will be presently contrasted with Figs. 26 and 27, which show the mode in which the mouth closes and the teeth meet in extreme old age.

A few months before five, the horse sheds the two remaining milk teeth, which are replaced by permanent. Thus the jaw is now furnished with six permanent incisors, but the corner teeth are mere shells, having no internal wall. The absence of this wall distinguishes the five from the six year old mouth. (Fig. 5.)

A few months before six, the inner wall of the corner teeth has grown up level with the outer wall. (Fig. 6.)

The mouth is now fully complete in incisors, and no further structural changes take place in them. As a general rule, we may add that the upper temporary teeth fall out a little before those in the lower jaw.

Up to six years old, therefore, inasmuch as we have structural changes to guide us, there can seldom be any doubt as to the age of the animal. There are, however, some well-authenticated instances of abnormal development of the permanent incisors, but they are rare.

Thoroughbred horses date their age from the 1st of January, whilst other horses are reckoned from the 1st of May. Thoroughbred mares are covered so as to throw their foals as soon as possible after the 1st of January; whilst in regard to other mares the owner does not wish to have their progeny born before the spring grass is available for the sustenance of the dam and her foal.

High feeding encourages the growth of the teeth in common with the rest of the frame. Hence thoroughbreds (independently of their earlier date of foaling) are somewhat more forward in their mouths than halfbred animals, though on the other hand it increases the wear and so hurries the obliteration of the marks.

Fig. 0.—*The Foal.*

Fig. 1.—*One year.*

Fig. 2.—*Two years.*

Fig. 3.—*Three years.*

Fig. 4.—*Four years.*

Fig. 4a.—*Four-year mouth closed.*

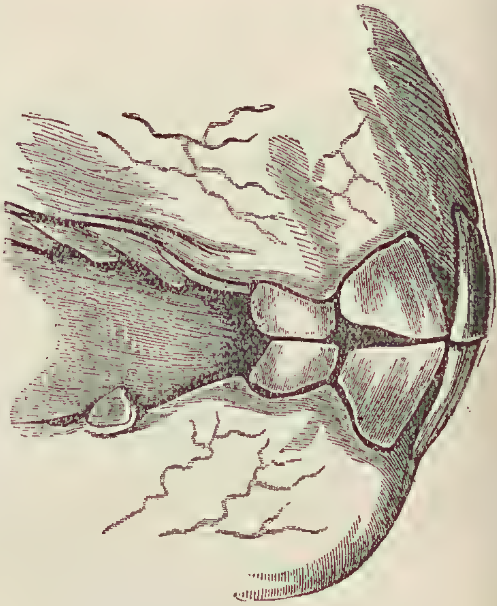


Fig. 5.—*Five years.*

Fig. 6.—*Six years.*

Fig. 7.—*Seven years.*

Fig. 8.—*Eight years.*

Fig. 9.—*Nine years.*

Fig. 10.—*Ten years.*

Fig. 11.—*Eleven years*

Fig. 12.—*Twelve years.*

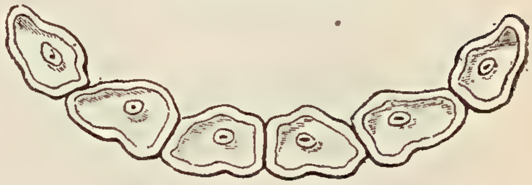


Fig. 13.—*Sixteen years.*

Fig. 14.—*Twenty years.*

Fig. 15.—*Twenty-four years.*

Fig. 16.—*Extreme age.*

Fig. 17.—*Extreme age.*

DRAWING OF MILK TEETH.

A practice prevails of tampering with the milk teeth, in order to make the animals appear of more mature ages than they really are.

In horses rising four years old the corner temporary incisors are pulled or punched out, in order to hasten the growth of the permanent teeth, which would in the process of nature take their place at a later period, and thereby give the horse the appearance of rising five years old.

More rarely attempts are made to give the three-year-old mouth the appearance of four by drawing the outer milk tooth on each side.

In the foreign horses now largely imported it is common to find both milk teeth drawn on each side in three-year-old animals.

No doubt in all these cases Nature does to a certain degree hasten the development of the permanent teeth, in order to supply the vacuum.

There is, however, no need for anyone to be deceived as to the real age of an animal which has been subjected to such treatment. The upcoming permanent tooth is usually displaced in its alveolus or socket by the violence used in punching out the milk tooth. Again, the removal of the milk tooth before its time deprives the upcoming permanent tooth of its natural guide to the surface of the jaw, and causes it to make its appearance slightly diagonally to the curve of the jaw, thus leaving a space between it and the neighbouring tooth, which is quite abnormal.

Again, the enamel of the crown of the new tooth, from having been brought into use before its natural time, is not properly consolidated, and hence presents an irregular appearance, quite different from that of the naturally developed tooth.

In males this trick may be at once detected by the absence of the tusk, which will not come up before its proper time; but in mares we have not this assistance.

OF THE MARK.

Hitherto we have taken no notice of the "mark," or infundibulum. We have abstained from doing so, not because the marks in the young mouth do not afford some indication of the age, but because fuller and more satisfactory evidence up to six years old is afforded by the structural changes detailed above. At and after six, however, we are compelled to have recourse to th indications given by the marks and other slight, but gradual, alterations whic take place in the form of the teeth and their position—these latter, howeve are more reliable than the marks.

A satisfactory explanation of the mark cannot, we are afraid, be given without entering at some length into the structure and organisation of the teeth. The mark of infundibulum is a very peculiar hollow, extending, when the tooth first comes up, about half an inch down the temporary and rather deeper down the permanent incisors.

Teeth practically may be said to consist of two materials—namely, enamel and dentine. Enamel, which is very hard, sharp, and originally of pearly whiteness, covers the outside of the teeth, and also lines the sides and bottom of the hollow or infundibulum. Thus in the tooth, as it originally appears, there are four walls of enamel. The remainder of the tooth consists chiefly of dentine, a substance of considerable, but less hardness than enamel, and more like ivory. A small quantity of *crusta petrosa* is also found on the outside of the fang extending upwards and overlapping the enamel covering the crown.

When an incisor first comes up, the hollow affords lodgment for the *débris* of the food and the juices expressed from it, and therefore soon looks black. As the tooth wears down, the hollow, of course, disappears; but the surface of the dentine immediately below the original hollow, being a somewhat soft material, has become stained for some distance down. Thus there is still a

black mark. With the further wear of the tooth the stained portion of the dentine wears away, and the "mark" is then said to be out. The mark, as the reader will easily see from this description, is in a constantly changing condition.

Premising that the time which the mark will take to wear out will vary to a greater or less degree according to certain circumstances detailed hereafter, we shall now endeavour to give some general rules for guidance.

Between three and five years old, all the marks are very plain in all the permanent incisors. (Figs. 3, 4, 5.) At six, the marks are wearing out of the two centre teeth, which came up at three years old. They are plain in the two next, and perfectly fresh in the two corner teeth. (Fig. 6.)

At seven, the marks have disappeared from the centre teeth, are wearing out of the two next, and are distinct and plain only in the corner teeth. (Fig. 7.)

At eight, the marks have disappeared from all but the corner teeth, in which they are becoming indistinct. (Fig. 8.)

At nine, the marks are not usually found in any of the teeth. (Fig. 9.)

For about two years after the mark has disappeared in each tooth, there may still be seen in the form of a star a trace of the enamel which lined the bottom of the original hollow, and which underlies it for some depth. This star, of course, decreases in size with the wear of the teeth. About twelve or thirteen, the last traces of the enamel have usually disappeared even from the corner teeth, but it may remain some time longer.

Many casual circumstances, however, cause a certain degree of deviation from these general rules. The time which the mark takes to wear out will vary in different horses according to the hardness or otherwise of the teeth and according to the nature of the food on which the animal is kept. In grass-fed horses the marks usually remain at least a year, and sometimes two years, longer than in those fed on hard food. Again, in parrot-mouthed horses—that is, where the upper overlaps the lower jaw—the marks may remain for many years.

On the other hand, some horses which have a trick of biting the manger wear down their teeth very rapidly, and therefore lose their marks very early. Horses fed on salt marshes where the sea sand is washed up among the grass, or on sandy plains or meadows, are affected by the increased friction on the teeth caused by the sand. Occasionally a projecting tooth in the upper jaw may cause unusual friction on the corresponding tooth of the lower jaw, and so may hasten obliteration of the mark.

Most of these and other causes of irregularity of wear which might be mentioned are at once apparent to a careful and accurate observer, and will scarcely prevent his forming a pretty correct opinion of the age.

The upper incisors, as previously stated, are considerably longer and larger than the lower, and the infundibulum is nearly twice as deep. The marks, therefore, remain longer than in the lower teeth. We mention this in passing, lest the reader should be misled if he should by chance refer to the indications given by the upper teeth to corroborate or correct any opinion as to age about which he may be in doubt from the appearance of the lower jaw.

Occasionally the dentine on the side of the infundibulum may become stained and even black, and in such cases something like a double mark may be observed.

The mouth, taken as a whole, is broader at seven years old than at any other period. After this it gradually narrows with age. In this respect the drawings, taken as a consecutive series, are in some degree at fault, as the author found it impossible to get mouths of the required ages to form a perfect ideal series. For instance, the mouth represented in Fig. 16 (extreme age) obviously has belonged to a very different animal from that shown in the preceding figure. Again, Figs. 16 and 17 are fair specimens, though very diverse, of what may be expected in extreme age.

BISHOP-ING.

Marks on the incisors are occasionally simulated by means of caustic or the hot iron by low dealers, with the view of deceiving the unwary.

The fraud is readily detected, because, though it is easy to make a black mark on the crowns of the teeth, yet it is impossible to restore the wall of pearly enamel which surrounds the natural mark.

THE FANG-HOLE OR SECONDARY MARK.

About nine years old, in consequence of the wearing down of the teeth, a slight trace of the fang-hole usually appears in the centre teeth, and somewhat later in the other teeth. It is indicated by a slight discolouration of the tooth at the above point. There is, however, no actual hole, because with advancing years the upper part of the original cavity has become filled up with a sort of spurious dentine, which is more yellow than the true material of which the body of the tooth consists. As age increases, this indication of the fang-hole, which is sometimes called the "secondary mark," becomes rather more plain. It, however, affords no reliable data by which to judge of the age, and is only mentioned in this place lest the reader should mistake it for the remains of the infundibulum. The enamel, it will be remembered, is pearly white, whilst the mark of the fang-hole is brownish-yellow.

FURTHER CHANGES INDICATING THE AGE.

It will be seen that about nine the "marks," never very reliable, entirely fail us, and indeed after seven or eight they can hardly be said to afford any very reliable data. Veterinary surgeons and horsemen prefer to judge the age mainly by the changes which gradually take place in the shape of the teeth. But the public always rely a good deal on the marks.

From eight years old and upwards the best indications of the age are given by the gradual alterations which take place in the shape of the teeth from wear and in the closing of the mouth.

Lateral Breadth, &c.—The teeth originally are *broad laterally* at their upper surfaces, otherwise called their crowns or "tables," and thin from front to rear. (Figs. 4, 5, and 6.) They narrow gradually towards their necks and fangs. Hence, as their upper surfaces wear off, the teeth become narrower year by year. In very old horses there is often a positive interval between the teeth (Figs. 16 and 17), and they appear like sticks in the jaw.

The gradual effect of wear in producing this alteration is shown in Fig. 20, where successive portions of the upper surface of the tooth are represented as having been removed by the saw. The original form of the tooth is shown in Fig. 21.

The amount of wear on the upper surface of the teeth is greater in the young mouth than it is afterwards, because in youth the teeth meet more fairly than they do in after years. (Compare Figs. 4*a* and 27.) The rate of wear gradually decreases as years increase, because the teeth do not meet so directly, but on the contrary project more and more forward in something like two parallel lines. For example, a quarter of an inch will usually be worn off the surface between five and six years old, whilst probably not more than that quantity will be worn off between twenty and twenty-five years old.

Triangularity.—A further very well-marked indication of increasing age is given by the increasing depth from front to rear in the upper surfaces or crowns of the teeth. This increase of depth will be noticed if Figs. 7 and 8 are carefully compared with Figs. 4, 5, and 6. Further wear causes the crowns of the teeth to assume a triangular form.

At six and up to eight years old, the teeth are all broad laterally at their upper surfaces. (Figs. 6, 7, and 8.) Up to this time the exact year, as the reader will recollect, is pretty well known by the "marks."

At nine, when the marks fail, the alterations in the crown surface or table come to our aid. The two centre teeth, which came up at three, become somewhat triangular. (Fig. 9.) At ten, the two next teeth show similar signs. (Fig. 10.) At eleven, the corner teeth have become somewhat triangular. (Fig. 11.) At twelve, the triangularity has increased in all the teeth. (Fig. 12.) This alteration continues to increase in all the teeth, until in very old horses the depth from front to rear exceeds the lateral width of the teeth. Fig. 13 shows an average mouth of sixteen years old. Fig. 14 represents the appearance at twenty. Fig. 15 shows twenty-four; whilst Figs. 16 and 17 may serve as specimens of the teeth in extreme age.

Length.—Again, as age increases, the teeth, notwithstanding they really wear down, become apparently longer. This effect is due to the fleshy parts of the gums receding faster than the teeth wear down. In extreme age, however, when the gums have receded as far as they can, the effect of wear causes the teeth to become *visibly* as well as *really* shorter.

Slope.—An alteration also takes place in the position or "slope" of the teeth, as regards their closing. This is due to the effect of wear. In youth the teeth meet directly, whilst in extreme age they can scarcely be said to meet at all. Their stumps project forward in two almost parallel lines.

The various changes which take place in the position of the teeth in reference to their position or "slope" are shown in Figs. 2 to 17. At two years old (Fig. 2) the gums are full, fleshy, and prominent, and the teeth are nearly perpendicular. The gradual changes which take place in the slope with increasing years are shown perhaps more clearly in the plates than could be explained in words.

Up to twelve years old there can scarcely be much difficulty in forming a pretty correct judgment as to the age. After that time it requires more time, practice, and opportunity than most people have at disposal to obtain the requisite knowledge.

It would probably scarcely interest the non-professional reader to trace very minutely the changes which take place after twelve years old. Suffice it to say that the gums continue year by year to recede, the teeth become *apparently* longer and longer and *really* narrower, and consequently the intervals between them increase, and they project forward more and more in a straight line.

About twenty or twenty-two, and in some instances a good deal sooner, the teeth, which up to this period have *apparently* increased in length, begin to grow *visibly* shorter, because the gums are so far absorbed that they can recede no further. Hence all further wear shows its effects by diminishing the length of the teeth.

Loss of Circularity.—In the very young horse the teeth are arranged almost in the form of a semicircle. Year by year this form decreases, until in old horses the teeth are arranged in something like a straight line. Compare Figs. 0, 1, 2, 3, and 4 with Figs. 14, 15, 16, and 17.

If the reader should happen to be in the neighbourhood of a cavalry barrack, he will have the best possible opportunity of studying the age of living horses, because in every regiment an accurate register is kept of the age of every horse. As all the horses are bought at four or five years old, it is almost impossible that any mistake can occur.

Memorandum.—The drawings of the teeth have all been made from Nature; and hence, although pretty normal specimens have been selected, yet in various ways they present in some instances irregularities and deviations from a positively regular rule of wear. Perfect regularity in wear and in the effect of wear is seldom found in Nature. In some instances it will be observed that the enamel is higher and more prominent than in others. This difference does not indicate or in any degree depend on age, but simply on the comparative hardness or softness of the enamel and dentine.

THE TUSKS.

In horses, as distinguished from mares, great assistance in determining the age is derived from the presence of the tusks, which are generally wanting in the latter. The tusks usually begin to appear in a very slight degree about three and a-half or four years old. Their sharp points then just pierce the gums, and they continue to grow until fully developed about five or five and a-half years old. They do not meet like other teeth, and therefore do not suffer from wear from that cause. They suffer, however, from wear in the course of mastication, and, in fact, undergo greater changes than any other teeth, and so form a valuable guide as to age.

The tusk is a very peculiar-shaped elongated tooth. Internally it consists of dentine, and is protected on the outside only by enamel. The enamel, however, overlaps the dentine, and hence arises the sharp edge or hook of the newly-developed tusk, which may be felt if the finger be brought round it from behind.

This sharpness gradually wears off. After seven, it has disappeared, and in each succeeding year the tusk becomes not only rounder and blunter, but its upper portion wears off. It also appears yellow, on account of the dentine becoming exposed by reason of the enamel wearing off its exterior surface. The tusks, unlike other teeth, do not apparently increase in length with years, but become shorter and shorter. In fact, the effect of wear is greater on them than on other teeth, and it is also greater than the process of the receding of the gum. In very old horses the tusk is very little above the level of the gum. Mares sometimes have four small rudimentary tusks.

UNNERVING HORSES.

WHAT THE OPERATION MEANS AND WHAT IT IS SUITABLE FOR.

Questions so often reach us ("Farmer and Stockbreeder") concerning these operations that it is evident that a large number of readers do not know the meaning of them. It is to such that we address the following remarks:—There are certain diseases which cause lameness, permanent and incurable. Lameness is said to be "the language of pain," and if pain is produced by progression, whether in the foot or some other part of a limb, it must be removed before the animal can again go sound. We must here make a distinction between *curing* a disease and removing pain. For example, we speak of a foot lameness as *cured* when we have removed an offending nail and the reparatory process has been carried out by Nature, and the animal again goes sound because no longer in pain. If the pricked horse were to be unnerved above the fetlock he would go sound and feel no pain; the soundness of his action would be due to the absence of feeling; but the disease would remain and increase, and the formation of pus would presently cause his hoof to come off. The case we have just supposed would not be *cured*.

If instead of a nail that has been wrongly driven, or "slivered," or been picked up (the poor blacksmith is equally blamed for all, though seldom genuinely responsible for either), if instead of this temporary cause of lameness there is chronic disease, the pain from which makes the animal lame, but which will not change the structure save by slow and almost imperceptible degrees, we divide the nerves which supply the suffering parts with sensation. Unnerving has been practised for a century, for the removal of sensation in the foot. When the animal has navicular disease, when sidebone or ringbone has been found incurable by blistering, firing, resting, and the opening of the horny foot by sawing, and other means—when, in fact, all else fails, unnerving may be resorted to with success.

DOES NOT CURE DISEASE.

It does not, save in a few exceptional instances, "cure" navicular disease or those bony growths above alluded to; it takes away the pain, and enables the animal to work sound. In the illustration (Fig. 1) the site of the operation is shown. A trunk of nerve runs down the limb on the margin of the tendon on both sides. An inch or so lower down it divides, and these branches break up again into smaller ones (like the branches of a tree) until their minute endings are found with difficulty distributed over the sensitive foot inside the hoof. Division cuts off the current, just as dividing a telegraph wire arrests the message.

The navicular joint is as nearly as possible in the centre of the foot, hence its sensation is derived from fibres of both the trunks referred to as running down the leg in pairs. It is, therefore, necessary to divide both trunks to procure insensibility. The division of a branch on each pastern has been practised for this purpose (Fig. 2), but is not so successful, as some few fibres from other branches go to supply the suffering structures. In the case of sidebone, it may be decided after careful examination that the pain is wholly on one side, more often the outside, then only one trunk of nerve need be cut, and the foot will have the advantage of some measure of feeling left—an advantage which will be appreciated by the reader when we come to speak of the sequels of the effects.

THE NERVE TRUNKS.

If the reader will now look at Fig. 3 he will see the nerve higher up, under the arm, just below a line drawn across from the elbow to the front. This is the main trunk as it leaves the body; the plantar nerves below, which are

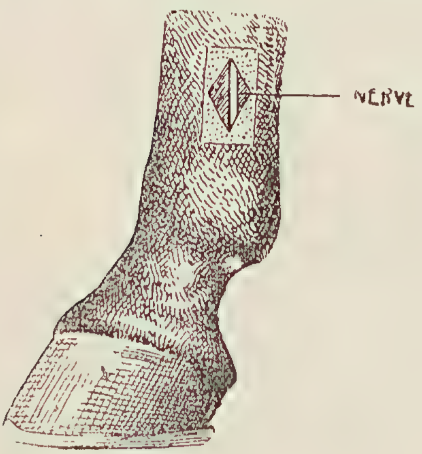


FIG 1

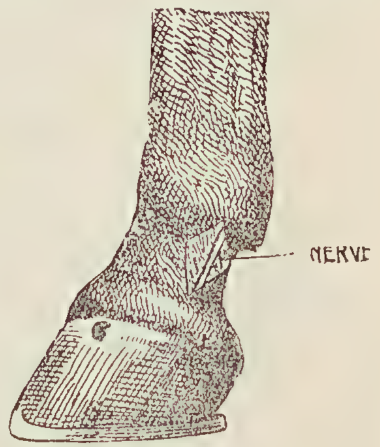


FIG 2.

shown in Fig. 1, are branches of this large one, but in descending the arm a small branch is thrown off, and travels down the back of the knee and passes with the tendons between that prominent bone at the back of the knee. This has its importance in connection with splints and knee lamenesses, as will be presently seen. The large trunk depicted in Fig. 3, and commonly called the median, is now very frequently divided instead of the plantar branches shown in Fig. 1, and for two reasons: One is for the removal of lameness in the knee and fetlock, or any place between those joints, and the other and less honourable motive is to do it at a place where it is neither likely to be seen nor felt. The best operators do not rest satisfied with the division of this trunk only, but proceed to divide the little branch behind the knee also. Professor Hobday

has published an account of some hundreds of operations of this kind, with very generally successful results. Fig 4 shows another nerve division for the amelioration of hock lameness, but, owing to the nerve supply of the hock being derived from several sources, it is not a very successful operation.

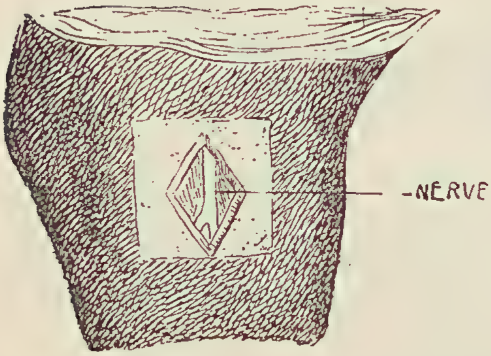


FIG. 3.

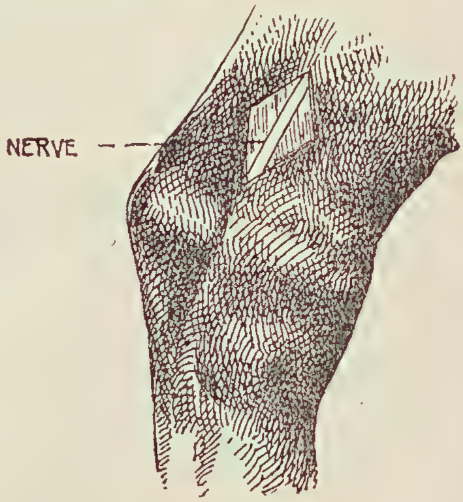


FIG 4

As unnerving is an operation none but the expert surgeon should attempt, we need not describe it in detail, but suffice it to say that it is the most merciful performance known to veterinary science. The animal is cast, completely anæsthetised by chloroform, the limb compressed by rubber cords to arrest circulation (when the lower operations are performed), the nerve quickly exposed, divided, and about three-quarters of an inch excised, the latter being done to prevent reunion. When bandaged with an antiseptic dressing, the animal is allowed to recover consciousness and get up. In about three weeks the wounds are healed, and he is fit to work.

THE AFTER EFFECTS OR SEQUELÆ.

If one ever speaks of unnerving in a general company, there will be someone present who has heard that horses have been known to lose their hoofs—"feet" he will say; and that is *all* he will know about it, as a rule. It is true that an unnerved horse will sometimes have his hoof come off; it is also true that it grows again if given the chance; but this seldom happens, as the subject is not of sufficient value to keep so long while it is being renewed, and the fate of the animal is sealed. If an unnerved horse is pricked in shoeing, he will not feel it. He "says" nothing, and the mischief goes on; the sole is underrun, and the hoof losing its hold perhaps, before anything is observed to be amiss. If he had corns before he was operated upon, these may fester unobserved, and break out at the coronet, and many a horse has been slaughtered in this condition in ignorance of the fact that he will just as readily yield to treatment as any other horse. One of my own horses thus broke out, and I put a seton through to ensure drainage, and continued to drive him with the tape tied in a knot, and visible to all. He recovered perfectly. At least three of the horses I have unnerved myself have worked for thirteen years afterwards. One had to be destroyed on account of old age, one is still the best horse in a livery yard, and another was sold to a tramway company, and his fate is not yet known to me. Some have only lasted six months, others six years; all sorts of periods of usefulness have followed; only one was an utter failure, and he was pricked when shod immediately before operation, and the trouble not suspected so early.

Suitable Subjects.

Not every horse that is permanently lame is a fit subject for unnerving. Discredit was early brought upon the operation for want of judicious selection. A low, weak foot is liable to fever, when pounded on the ground, with no pain to warn the animal. One with corns is risky, unless indeed he belongs to a very thoughtful man, who will make periodical examinations. A frog rotted away with thrush offers a surface easily penetrated by a nail or sharp flint on the road. Horses with these defects should not be done for careless persons who will not make frequent examinations, or go to the expense and trouble of sole leathers for protection, and their removal at short intervals. I have bought and unnerved, for myself, horses that I could not safely do for others. I knew that their feet would so soon grow out of the risk that it was worth taking. This brings us to another popular prejudice against unnerving. It is often said that the feet decay or "rot off" because deprived of nerve force. They do not. The nutrition goes on as before in any case, but the rule is an increased amount; hence the general rapid growth of the horn. I have been driving one to-day that came out of a tram company in May last with a number branded high on the front of the hoof. Not a vestige of it remains. She has been on a job for four months, and earned more than she cost. Her feet have been cut back several times, and are still so long that to prick her would be almost impossible.

Horses with high action and long pasterns are not good subjects for unnerving, because they put such a strain on the diseased tendons connected with the navicular bone as to cause them to break away, this being seen by a gradual filling of the heel and final tilting up of the toe. It should, however, be said that this result only follows when operation has been too long delayed. My long experience teaches me that navicular cases should be "undone" directly it is definitely decided that the cause of lameness is due to that malady, and not, as so commonly happens, when the R.S.P.C.A. have at last intervened to stop the working of an animal that is always in pain, whether at work or rest. Every other means should first be tried in sidebone, ringbone, and those other troubles for which unnerving is resorted to.

Blistering Unnerved Horses.

If my readers have honoured me with careful attention to the foregoing remarks, they will remember that I have emphasised *the growth of the foot as proof of nutrition going on*, not less fully, but more so, than when the suffering animal feared to put his feet down boldly on account of pain. This cannot be denied, and should be as good proof as either professional man or layman can require, but here comes an inexplicable fact. Despite the continued nutrition of the *foot* and the retention in the *leg* of full nerve sensation, if the leg is blistered, for any reason whatever, it will *turn to jelly*.

I did not believe this until I paid the penalty by blistering one of the best cobs I ever owned. You, reader, get the information for a fraction of a penny. Knowledge, nowadays, is for all who will accept it. It used to be obtainable with difficulty by the few. This last remark, which is something like a "stage aside," reminds me that space is running out, and I will conclude by remarking that, whatever objections there are to unnerved horses which work sound and are free from pain, they are worth more than cripples, condemned to perpetual suffering.

THE PRINCIPAL POINTS OF A GOOD HORSE.

By P. R. GORDON.

The following remarks are not penned with the object of advocating the point system of judging horses, but to bring into prominence the principal points of a first-class horse; nor does the writer arrogate to himself the ability to instruct the many in Queensland who are more competent horse judges than himself. For many years past the general horse stock of Queensland has

so greatly degenerated that it is feared that many of our younger horse-breeders have not had the privilege of object lessons in the points that constitute a superior horse enjoyed by those in other horse-breeding countries, or even in other parts of Australia; and, therefore, the present object is to focus attention on them, adding a description of each point as adopted by various clubs and associations interested in the improvement of the horse. The better to impress those points on the reader, a diagram of a hackney stallion, with the various points mapped out, is given as a heading to this paper. The hackney has been selected by preference because, being serviceable for both saddle anl light harness, it is the description most generally in request and use, and is by far in greatest demand by foreign buyers; but, as Lord Dunmore remarked, the true heavy Clydesdale is only a huge Arab. The structure of a hackney should therefore also apply to a heavy draught horse. The diagram I have borrowed from a pamphlet written by the late Mr. Alexander Bruce, late Chief Inspector of Stock for New South Wales. It will be observed that the number of points have been given as 38; but as the first seven refer to pedigree, general character, style, action, colour, size, &c., these cannot be shown on a diagram, so that the points indicated commence with No. 8 of the diagram. By arranging the various points under five groups we have first the HEAD, with five points, namely—

No. 8, EAR.—Active, thin, and generous in length. The action of the ear with the eye discloses character.

No. 9, FACE.—The head as a whole should be in proportion to the size of the horse. It should be broad between the eyes, with prominent brain development; clean and bony.

No. 10, EYE AND EXPRESSION.—This organ and the ear shows character; and not only the fulness of the eye, but its character, should be well studied. It should be bright, mild, lively, and truthful.

No. 11, JAWS, should be wide apart, to give ample room for the windpipe.

No. 12, LIPS, should be neat and compressed, and not open or hanging down.

No. 13, NOSTRIL, should be wide, high, active, and delicate.

FOREQUARTERS.—This group is subdivided into six points—

No. 14, THE NECK.—This point includes the setting on of the head, the length and shape of the neck, the free development of the windpipe, especially at the throttle and the junction of the neck with the shoulders and breast. It should be somewhat long, and slightly arching.

No. 15, THE BREAST, should be sufficiently full and deep to give ample room for the heart and lungs, but not so heavy as to interfere with speed.

No. 16, THE WITHERS, should be high, to give safe action, muscular, and sloping evenly into the shoulder.

No. 17, THE SHOULDERS, should be strong and muscular, well laid back, and should rise with a clean and even slope towards the withers.

No. 18, THE FORERIBS, should be round (hooped), deep, and full. There must be ample room for the heart to beat and lungs to play. Deficient in this respect, his stock will lack vigour of constitution and staying powers.

No. 19, CHEST, should be deep and well developed, and should run evenly into the shoulder—not chest-tied.

The MIDDLE is divided into six points, namely—

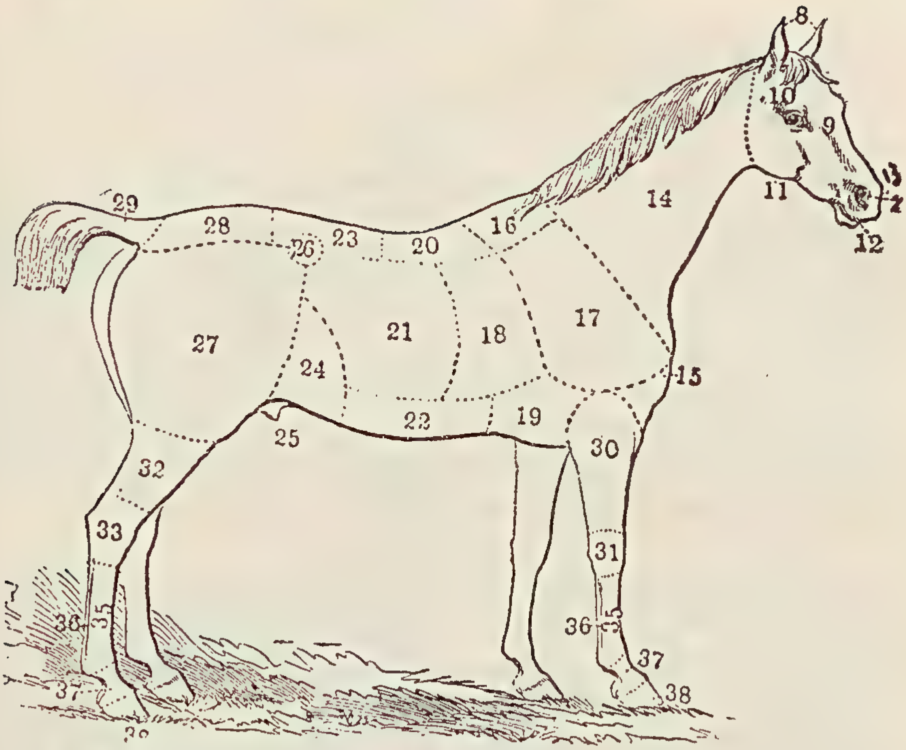
No. 20, THE BACK, should be comparatively straight and broad, and should run full wide and level into the loin.

No. 21, BACK RIBS, should spring roundly in an arch from the backbone, and run well back towards the hindquarters—*i.e.*, well-ribbed home—and the last ribs should be round, and well let down.

No. 22, THE BELLY, should be fairly well let down, but not "pot-bellied," nor too much tucked up, and with sufficient room for food.

No. 23, THE LOIN, should be full, long, level, and broad, extending along the back, to give strength to the horse.

No. 24, THE FLANK, should be clean, neat, and fairly developed.



No. 25, The Sheath, should be well developed.

The Hindquarters form the fourth group of four points—

No. 26, The Hips.—The hip bones should be well apart, not protruding, but symmetrical.

No. 27, The Quarter, should be broad and strong, the stifles well apart, and wide when viewed from behind, with well-turned buttocks.

No. 28, The Croup, should be long and comparatively level, but with a proper elevation, sloping towards the tail.

No. 29, Tail and Set-on.—The tail should leave the croup, and be carried gracefully at the proper height, with free but soft strong hair.

The fifth group relates to the Legs, and is divided into nine points, namely—

No. 30, Forearm, should be muscular and well developed.

No. 31, The Knee, should be comparatively large, strong, and clean, with the different members clearly defined.

No. 32, The Gaskin or Thigh, should be broad, well developed, and muscular.

No. 33, The Hock, should be strong and clean, with its different members clearly articulated, and nearly straight to the ground.

No. 34, The Legs, should be short, straight, wide set, well forward (not heavy in the shoulder), but properly proportioned.

No. 35, The Bone, should be comparatively stout but flat, broad under the knee and hock—not knee-tied.

No. 36, The Muscle, should be clean, clear of the bone, well defined, and sinewy.

No. 37, The Pasterns, should be rather stout and short, with well-developed muscles, and set straight and at the proper angle.

No. 38, The Feet, should be fair-sized, rather large, well shaped, neither too open nor too close at the heels, giving evidence of strength and freedom from internal trouble, and they should be straight and fair, neither turned in nor turned out at the toes.

Poultry.

WHY DO WE CROSS-BREED POULTRY?

The Utility Poultry Club ignores crossbred fowls, and has given a great impetus in the direction of pure breeds. Yet, for table purposes, crossing is absolutely essential, says "C. D. L.," in the "Chamber of Agriculture Journal." It is more profitable to cross than to breed pure breeds for table, and for laying purposes there is no doubt crossbred fowls could equal the best records yet made in laying competitions. For instance, both the White Leghorn and the Buff Orpington have done well in laying competitions, but a cross between the two would very likely have done better. Why, then, are crossbreds at present under a cloud? It is not owing to any fault on their part, but simply because there is an idea abroad, which is, perhaps, well founded, that there is more money in pure breeds, simply because they sell better as stock birds.

A Common Origin.

All our domestic breeds of poultry, it is well known, spring from a common origin, but we have to-day two clearly defined types, that of the big heavy fowl, which lays a coloured egg, and is best known as a table bird, like the Dorking, and the light, small, active fowl like the Leghorn, which is a poor table fowl but a good layer. Then there are the Asiatic breeds, the Cochin and the Brahma, practically extinct to-day, but living again in newer breeds, like the Buff Orpington and the Faverolles, which owe much of their utility value to them. Breeding to type—that is, keeping the breed absolutely pure—has a tendency to decrease size and stamina; in fact, by the time perfection from the feather point is gained the birds will be nearly sterile. The same rule applies to ducks. One breeder, whose strain of a well-known breed is hardly ever beaten at shows, told me the more his ducks improved from the show standpoint the worse they laid. Fanciers are seldom so frank, but there is little doubt the same rule holds true for fowls. To improve size and utility we cross, and to get the full advantage of crossing we should cross two breeds as distinct as possible. Still, for egg-production, crossing two breeds as similar as the Leghorn and the Minorca can be recommended. The result, of course, cannot improve the size or the table qualities, but we get birds with more vigour and stamina, and as layers they frequently beat both Leghorns and Minorcas, even when bred for laying. But to get the full value of the cross, two such dissimilar breeds as Leghorns and Orpingtons should be mated; the only drawback in the result is that we get tinted eggs. This is only to be expected when one of the breeds lays a white egg and one a brown. Unfortunately, a tinted egg is, from the market point of view, worth no more than a white one, while a brown is worth more. But we get increased size—that is to say, the chickens are nearly as big as the Orpington, much bigger than the Leghorn—and as layers are first-class, especially in winter. They do not become broody so often as Orpingtons, and are wonderfully hardy. In fact, to lay down a general rule, crossbred chickens are hardier, grow faster, and can be reared with a smaller death rate than pure breeds.

The Question of £ s. d.

But the question of value remains; the professional breeders find pure breeds pay best, but I am addressing readers who are chiefly farmers, and need a profitable fowl—that is to say, the one that pays best for eggs and poultry. The professional breeds to sell again; he sells sittings of eggs, day-old chickens, and stock birds. The farmer seldom enters into competition with him, but is content to sell him surplus birds for market. In this case, when eggs are chiefly

aimed at and no stock are advertised for sale, crosses may be advised. Even that useful farm fowl, the Buff Orpington, can be improved by crossing it—if for table by crossing the hens with a Dorking cock, or a Faverolles, or an Indian Game; while for eggs a cross with the Leghorn is an improvement. For the table, there is no question about the advantage of crossing. The pure Dorking is undoubtedly our finest table breed, but it is a slow grower, and not suitable for all soils. The best table cross, it is well known, is the Indian-Game Dorking; this gives hardihood to the chickens, and they grow faster. The Faverolles cross, if it does not attain the same size, grows even more rapidly. In crossing it is frequently advised never to go beyond the first cross; that is, that both the parent birds should be purebred. Still, on occasions, this rule can be broken, but I would recommend that the cock bird be pure. It must not be forgotten that crossing too freely produces mongrels, and they are generally good for little.

In America, where they rely almost entirely on pure breeds, they have no table fowl to equal ours. Their best birds are the Rocks, which we reckon quite second-class; not alone because they are yellow-fleshed, but because they cannot attain the size and quality of what we call first-class table poultry.

Laying Contests.

Interesting as the Utility Poultry Club's laying competitions are, they would, I submit, be even more instructive if crossbred fowls were also admitted, or, rather, if a certain number of pens were allotted to them. Breeding for eggs is not so easy as some imagine, and the chief difficulty is that the temptation is to inbreed, and in the result we get delicate chickens and hens with a tendency to fall ill. But in their ambition to own a "laying strain" breeders are becoming reckless, and all the faults for which the fancier has been blamed in the past are manifesting themselves in this new craze. Egg records are not everything. If the hen has to be pampered and coddled to produce them she is no good for the farmer. Yet I grant the temptation to breed them is great, as a successful laying strain is a little goldmine for its lucky breeder. He can sell his eggs at fancy prices, or day-old chickens at a guinea and more the dozen, and pullets at the price of fancy prizebred stock. But the average farmer has no time or inclination to produce his own laying strain. He prefers to buy a few birds to form the nucleus of his new stock. If, then, instead of buying one breed he buys two, or, rather, if he buys, say, Buff Orpington hens, and mates them with a Leghorn cock, he will find the chickens just the sort he wants, and equal to many highly-lauded "champion laying strains." But he must not introduce any alien blood, and the stock birds must be well grown and full of strength and stamina.

EXPORT OF EGGS.

The recent shipment of eggs from Melbourne and Adelaide to London has, in addition to proving financially successful, provided some useful object lessons. In the first place, the fact that the infertile eggs averaged 3d. per dozen more than the fertile is a valuable demonstration of the superiority of the former for market purposes, and should be an eye-opener to those who persist in running useless males with their hens year in and year out.

The consignment was despatched at the end of October last, and consisted of four grades—two brown and two white. The prices realised were:—

	Per Long Hundred in London.	Per Dozen.	Net to Producer. Per Dozen.
Brown eggs ...	... 9 6 ...	0 11 2-5 ...	0 7 3-5
Large brown do. ...	... 12 0 ...	1 2 2-5 ...	0 10 3-5
White do. ...	... 9 0 ...	0 10 4-5 ...	0 7
Large white do. ...	... 11 0 ...	1 1 1-5 ...	0 9 2-5

All the eggs weighed not less than 2 oz. each, and it will be noticed that the brown eggs realised more money than the white ones. The eggs forming the shipment in question were collected from producers between 1st and 25th October, cool stored until departure, and, of course, travelled in the ship's cool chambers. At that time selected lots of eggs were bringing from 7d. to 7½d. on the Melbourne market, and less in Adelaide. As 3 4-5d. covers all charges, both here and in London, there is enough margin of profit on the large eggs to encourage poultry farmers to persevere. The shipping season is during the spring and early summer, when eggs are most plentiful and cheapest in Australia.—"Farmers' Union Advocate."

ARTIFICIAL INCUBATION.

By M. FERN.

To the grower who intends hatching a large number of chickens the incubator will prove a necessity. The advantage of the machine over the hen is—

1. That a much larger number of chickens can be hatched with the same attention as a few would take up;
2. The machine can be run at a time when "broodies" are not to be had—*i.e.*, in the earlier months of the hatching season—and late hatches can be brought off with a fair chance of success, as the chicks will start free from vermin.

In using incubators, constant care is necessary, as, so far, none of the makers have brought out a machine that can do the thinking.

Although there are a few general principles and rules governing hatching by machine, the beginner would be wise in sticking to the instructions sent out by each maker for his particualr machine. It is true that the difference is only in details, but they should be closely followed till the operator has gained sufficient experience, and a clear knowledge of what he expects to accomplish.

PLACING THE INCUBATOR.

The best place to run an incubator is in a well-ventilated dry cellar. They can be run successfully in rooms, but great care must be taken that they are not subject to too much variation in temperature.

They must be kept out of a direct draught.

STARTING THE INCUBATOR.

If the operator has had no previous experience of incubators, he should, after deciding on the best situation, get the machine into position; this should be done by someone who is thoroughly acquainted with the working points of the machine. All the parts should work freely, and the points of the gear working the rod should be carefully adjusted to directions. The machine must be dead level, particularly if a hot water incubator.

After everything is in order and ready to start, the incubator should be started a couple of days at least before placing the eggs.

The beginner should learn to adjust the balance, and be able to control the machine before any eggs are placed in.

SELECTING EGGS FOR HATCHING.

The same rule must be followed as in the case of hatching under the hen. Eggs should be fresh, not more than a week old. They should be as nearly as possible of one size, and should be placed in the incubator together, and not from time to time. Better results will always be obtained from any machine that is being run with its full complement of eggs than when only half or part of number are placed in machine.

It is a good plan for the operator to place a number of eggs at the time of starting in another small incubator, or under hens or turkeys, so that on the fifth day, when infertiles and dead germs are tested out the larger incubator may be refilled with its full number of fertile eggs.

In keeping eggs for incubation they should be stored in a cool place till ready for starting.

The thermometer should be sent to be tested by a standard instrument. Don't trust to any purchased instrument; I have known them to be 3 degrees out. This would be enough to spoil any hatch if reliance were placed on it.

After the machine has been heated up to the necessary temperature, and has been run for a couple of days to enable the beginner to control the regulator, the eggs may be placed in the machine, and the hatch proceeded with.

Don't tinker too much with the regulator unless the variation is very great.

The Lamp.

The greatest care must be taken with the lamp; it must be kept perfectly clean, only the best oil to be used; the wick should be trimmed daily. I would warn beginners to watch the lamp carefully after trimming. It often happens that the operator trims the lamp, adjusts the size of the flame, and goes away thinking everything is all right. On coming back perhaps in a short time he finds the flame has drawn up, the lamp smoking, and the thermometer up to 110. Watch your flame till you are certain it is going regularly.

Temperature.

The temperature varies in different makes of incubators, but generally runs from 101 to 103 degrees. Care should be taken during the first ten days to keep the machine at a temperature not over 103 degrees—rather under than over. Should the temperature fall or rise for a short period, there need be no fear, as, after all, there is a great range of temperature at which hatching will proceed from 98 degrees to 110 degrees, if not too prolonged.

Of course, it is not intended to convey the idea that a machine can be run carelessly, but only to warn the beginner not to give up hope if the temperatures vary occasionally.

The more even the temperature is kept to directions the better.

After the fourteenth to sixteenth day the eggs can stand a fair amount of variation, and should by any unforeseen reason the lamp go out for any reasonable time, it is not hopeless. The lamp should be relit, and perhaps the only result will be a delay in time of hatching.

Turning and Airing the Eggs.

Eggs should be turned and aired after the first two days up till the nineteenth.

They should be turned twice daily, and aired while trimming lamp, about ten minutes daily for the first week, after that slightly increase the time daily; if hot weather prevails they may be left out for twenty to thirty minutes.

Turn the eggs by hand. Some of the machines have patent turning devices, but the beginner would be wise in discarding same, and handle the eggs separately. A better knowledge of the state of the egg will be gained as to fertility and chance of hatching.

Hatching Time.

As a general rule, on the nineteenth day the chicks begin to chip the shell; at this stage the beginner is warned against opening the door of the machine unless there is need.

Wait till a number of the chicks are out, and if there is no way for them to get into drying chamber the door should be quickly opened, shells removed, and chickens placed in dryer.

Never pull the tray out while hatching is going on, and whatever is done must be done quickly, and the door opened only when necessary, and not to help out every struggling chick.

The operator need not be alarmed if the temperature jumps up while the chicks are hatching out, as this is caused by the animal heat of the newly hatched chickens.

After the hatch is complete, the machine must be carefully cleaned and disinfected before being used again.

Tropical Industries.

THE CULTIVATION OF RUBBER FOR TROPICAL AUSTRALIA.

BY HOWARD NEWPORT, F.R.H.S., Instructor in Tropical Agriculture, Cairns.

RUBBER IN THE TROPICS.

The rapid extension of the area under rubber in the tropical parts of the world, and the absence of any indications pointing to reduction in price, at any rate in the immediate future, which has largely caused such universal planting up in localities where the conditions are favourable, has attracted the attention and interest of many people in this country; and not only of settlers, farmers, planters, and people "on the land," but of dealers in and manufacturers of the marketable product. So much so, that this office is in almost daily receipt of applications for information and advice *re* culture, or seeds and plants for experimental planting on the one hand, and information, on the other hand, as to where raw rubber—in any form whatever—may be obtained in the country, the names of growers or estates producing it, and the quantity likely to be obtainable. To those whose work lies in the direction of the encouragement and advancement of such agricultural industries, who have the knowledge and experience, see the possibilities, and appreciate the importance of rubber culture, both financially and as a factor towards the greater and better settlement of the Northern district and territories, it is disappointing indeed to be able to give only such unsatisfactory replies to the latter queries as that but little is being done, only a comparatively few trees are yet in bearing, and scarcely can a single instance be pointed to in which any appreciable area or estate has been opened under this valuable staple.

RUBBER EXPERIMENTS IN AUSTRALIA.

The idea of rubber cultivation in the tropical areas of the Commonwealth is no new thing. Rubber has been grown, acclimatised, experimented with with considerable success, written about, advocated, reported upon, &c., by that indefatigable officer of the Northern Territory, Mr. Nicholas Holtze, of Port Darwin, following in the footsteps of his father, Dr. M. Holtze, F.L.S., of the Botanic Gardens of Adelaide, South Australia. Rubber has been found growing wild in the new great tropical State of the Commonwealth—Papua, perhaps better known as yet as British New Guinea—under conditions of climate, soil, rainfall, temperature, and latitude similar in every way to miles square of country in the body of the Australan continent, and this rubber has been collected and imported to Australia and favourably received.

Rubber plants or seed of several—the most important—varieties have been introduced to Queensland itself by the Government, acclimatised, cultivated, propagated, experimented with, and tapped with satisfactory results, at the institution of tropical economic products, the State Nursery at Kamerunga, Cairns. Rubber cultivation has been written about, reported on, advocated, made the subject of lectures and speeches by the Government officers in Queensland; and the public Press has from time to time referred to it, suggested it, quoted the figures and returns in connection with it, and drawn attention to the progress of its culture in other countries. It would seem, however, that the advocates of rubber—or shall I say "rubber prophets"?—have been looked upon as being too much "in their own country," have received but little "honour" in the sense of credence, and have not been taken seriously. Rubber culture, unfortunately for the country, has apparently been included in the regrettably large list of what has been referred to in writings from time to time as "neglected" or untried industries.

WHY SETTLERS DO NOT FAVOUR IT.

The replies to suggestions that trials should be made have covered a very wide range, and include the fear that synthetic (or chemically made) rubbers would very soon be an accomplished fact and capture the whole markets; that it took too long to come into bearing, &c.; but the principal objection—sometimes openly stated, but more frequently found to be the real basis of excuses—would seem to be that, if taken up, it holds out prospects of requiring more or less detailed attention with which settlers "can't be bothered." Not merely would it seem that incentive is required from sources outside the country itself, but that the tropical agriculturists of these parts require a lead to be given to them; that if one or two private individuals could make a success of it—apart from such experiments as the Government might carry out in special institutions—others would follow. This fact would not present itself as a hindrance to the advancement of the industry so much did the same thing not apply, on a smaller scale again, to the individuals who wish to prove the unqualified success and payability of a few, very few, individual trees before attempting any appreciable area. Rubber, from the fact of the time it takes to come into bearing, does not lend itself to proof in this manner except with tremendous loss of time. Moreover, the grower on the small experimental scale like this, having other things to do for his living and to occupy his attention generally, does not give it the attention likely to result in any appreciable profit, either of money or experience.

RUBBER CULTURE IN PROMINENCE.

There is no doubt that one of the factors operating against any such rapid expansion of this industry in Australia generally, and Queensland in particular, has been hitherto the unsettled political state of the country and uncertainty as to labour conditions. This unrest in matters political came at a most unfortunate time for Queensland and the rubber industry, for, roughly speaking, it is during the last eight or ten years only that the cultivation of rubber has received serious attention, and such countries as the federated Malay States, Ceylon, and the Straits Settlements, &c., have come to the front with their scientifically grown, cultivated, and tapped plantations, and scientifically cleaned, coagulated, pure product, and forced themselves into conspicuous positions as not to be ignored factors in the world's rubber supply. Indeed, to such an eminence has the cultivation of the product attained that, were it not for the increasing and stable demand, the original sources of supply would be likely almost to cease to be remunerative through inferiority of quality in spite of the cheapness of collection.

The unfortunate state of affairs above outlined has proved a handicap to Australia that has put it behind in the race, and allowed other countries to get ahead by several years at least with estates well on their way to maturity. This has apparently equally applied to Papua, as evidenced by the passing over of this eminently suitable country for rubber culture by settlers, planters, and investors, in favour of the Solomon Islands, New Hebrides, and even Fiji, &c., where the plantings of rubber can be counted in hundreds of acres, if not thousands, while Papua is scarcely out of its teens in this respect, and Australia barely in them.

RUBBER FOR QUEENSLAND.

While countries having the soil and climatic conditions suitable are being sought out by investors throughout the tropical parts of the world, and countries made rich by the possession of such valuable and paying industries, there is no reason why the tropical areas of this, our country, richer in every way than many if not most, should not participate; and it devolves upon the Governments, Federal as well as State, and the people, owners of land and investors as well as others, to wake up to the fact that wild tropical jungle lands alongside of us, looked upon as almost impossible of settlement from difficulties of

unhealthiness and inaccessibilty, with all their disadvantages are being peopled and opened up and enriched, and that before ours, with an industry equally possible with us, and which, with our advantages of accessibility and civilisaton, should be even more paying and profitable.

TIME COMING INTO BEARING.

With regard to the length of time that rubber takes to come into bearing, brought forward as an objection by some and referred to above, it is not denied that this, as well as other tropical products, does take some years. Nature would seem to provide that quite a number of the most valuable products, including those comparatively easily harvested once maturity is attained, should require the exercise of some virtue for their enjoyment, and if mere application or hard work will not apply, then patience must. This, however, if looked upon in the light of the prevention of its becoming too cheap or easy of production, has distinctly a favourable rather than an unfavourable aspect. As an argument against the planting of rubber in Queensland—though it may seem absurd to talk of any such arguments—it would seem to be more fanciful than real. For, if it held good, products from which returns can be obtained in six months, more or less—such as, to quote an instance, cotton—should be extensively cultivated, and those which take a number of years to attain maturity—as, for instance, fruit—might be expected to be comparatively less popular. Whereas cotton is not receiving the attention it warrants, and fruit culture, as an established industry, is claiming large areas annually.

A plantation of rubber, it may be noted, *will take no longer to come into bearing than an average orchard of citrus trees.*

LIFE OF RUBBER PLANTATIONS.

While appreciating the difficulty and inconvenience of having capital tied up for even so long by a community to whom a floating capital quickly turned over would seem necessary to success, the very fact of the time that a staple takes to become income-producing may be taken, as in the above quoted instances, corroborated everywhere, as evidence of its stability and lasting nature. As a rule, the staple that comes into bearing quickly is liable to go out of cultivation equally quickly, while the staple taking years to bear has a comparatively very much enhanced longevity. So with rubber; once established, a plantation may be expected to continue producing for a large number of years, probably exceeding rather than otherwise the three score years and ten laid down as the average life of man.

Again, with short-lived staples the cultural attention necessary is practically continuous, while with the long-lived products, though the work and attention during the period previous to its coming into bearing may seem tedious and unremunerative, the older the plantation the less the attention required in this respect. So that, when the work of, say, the first five years comes to be spread over a life of even fifty years of productivity, the actual amount of it compares most favourably with that required by the apparently less costly because quicker producing staples. To sum up, therefore, for three good reasons—viz., as a protection against quick fluctuations in value, as evidence of longevity, and as holding out prospects of less cost and work in cultivation, the time coming into bearing, instead of being considered any objectoin to rubber culture, becomes a point in favour of the staple.

A SAFE AGRICULTURAL INVESTMENT.

Rubber, therefore, as an industry, is of more value to the community, State, and country than would be a short-lived staple. From its very nature as a strong-growing tree, it is less liable to be affected by variations of temperature, rainfall, or season; and a rubber plantation may be considered, therefore,

one of the safest possible of agricultural investments. The incentive having been supplied, as evidenced by the spontaneous queries and applications for information now being received, by the tremendous spread of the cultivation, more especially of Pará (*Hevea braziliensis*), trees in the tropical world, and so close to our shores, it is suggested that a series of articles dealing with the matter be written in the "Queensland Agricultural Journal," illustrated from time to time by pictures of trees already within the Commonwealth, and the various operations necessary, and describing and explaining in detail the propagation and cultivation of the trees, and collection, preparation, and marketing of the product.

ANSWERS TO QUESTIONS PUT.

In this, the first of the series, it is proposed to answer a few of the principal questions asked by applicants, and, while perhaps some of the questions and answers may seem futile or elementary to some, I trust they will bear with me, and remember that there are others not so clever as themselves to whom the information is necessary, and also the fact that seemingly insignificant facts or elementary pieces of information are not to be ignored, for to the absence of such knowledge may often be attributed subsequent failures and annoyances, and that in subsequent writings it is taken for granted the reader possesses such knowledge.

To those applying for information, I would add, just here also, that while it only takes half a sheet of notepaper to ask for detailed information from the planting to the marketing regarding rubber or any other tropical product, it would take more than the other half sheet to give it. Indeed, nothing short of several good large volumes could contain all that has been, could be, or may be said about the many varieties of plants that produce marketable rubber, and answers to questions by letter must necessarily, therefore, be epitomised.

RUBBER SAMPLES AT THE A.N.A. MELBOURNE EXHIBITION.

The samples of crude rubber (Rambong or Assam) from the *Ficus elastica*, sent down from the Kamerunga State Nursery to the A.N.A. Exhibition at Melbourne recently, judging from letters received, have attracted some attention. Users of the raw material—*i.e.*, manufacturers of rubber goods from imported material—are asking for further samples and specimens, an indication at the outset that a ready market exists without exportation. To the ordinary individual the sample of crude rubber is of certain interest; what it is for, and what its general uses are, may be pretty well known, but as to what it really is and how obtained opinions are as varied and frequently incorrect as they were about the pineapple plant and its fruit seen growing in the exhibit.

WHAT IS RUBBER? AND HOW OBTAINED?

That it is some sort of a gum from some sort of a tree is known, but as to whether it is obtained by boring into the tree, just as the sugar is obtained from the American maple-trees, broken off the bark like bloodwood gum, crushed out of the plant like sugar juice, or obtained by scoring like opium from the poppy heads, are some of the questions asked and ideas promulgated. The rubber of commerce is, according to the dictionaries, " a vegetable substance obtained from incisions made in plants affording a milky juice" ; the chemist, on the other hand, will tell you that it is a carbo-hydrate—that is, that it is composed of the same chemical elements as sugar or starch is, but in different proportions and in another form—all of which is true and interesting, but does not convey quite what the inquirer wants to know.

LATEX.

Rubber of commerce is the coagulated—that is, thickened or hardened—*latex* of certain trees, commonly called a sap, but it is not a real sap necessary in building up the living tissues of the trees as is the true and generally

colourless sap found at the same time in the inner bark or sapwood of the tree, but is a secretion formed in the outer bark or *cortex*, the object in Nature of which would seem to be the preservation of the tree from the attacks of insects and the healing of wounds. So it is that when the bark of trees which produce rubber-bearing latex is pricked, or cut, or bruised, this milky secretion (*latex* or juice, Latin, from its milky appearance) flows out, and at once fills the hole or covers the wound, keeping out the air, and quickly thickening and preventing further injury by insects, &c., until the bark has had time to grow again. While the latex is part and parcel of the growing tree it is, at the same time, not one of the vital principles of the tree, and therefore, roughly speaking, if it could be withdrawn without damage to the tree and without withdrawing any of the vital and colourless sap, the tree would not die.

THE LACTICIFEROUS SYSTEM.

This latex is contained in certain special cells or ducts (called "latex tubes" or the "lacticiferous system") in the cortex (outer bark), and also in the middle or cellular bark, and is secured by cutting the bark in such a manner as to open these ducts without touching the "bast," or inner bark, and the cambium or the viscous secretion, formed in the inner bark, between it and the young wood and in the first few layers of the young wood itself, and with as little damage to the outer bark even as may be possible. The cortex renews itself, and after it has thickened may be cut or tapped again, but the inner bark or sapwood generally does not, and wounds in it, therefore, generally mean permanent injury to the tree. This matter will be fully dealt with under the heading of "Tapping," but this much will serve to show the following points, which are of importance to the intending planter: That care is necessary, but that with care rubber-trees may be expected to continue to bear for many years.

RUBBER AND CAOUTCHOUC.

The term rubber, the coagulated latex of certain trees as defined above, is usually given in dictionaries as synonymous with caoutchouc, and in reality it is so. Caoutchouc is a compound word, derived, according to Johnson,* from the native word *caaochô* or *caaochu*, derived from *caa*, meaning wood, and *o-chô* or *o-chu*, to run or weep—referring to the tear-like flow of the latex—and was at one time used almost exclusively for the product we now commonly know as "rubber"; while the word "rubber," on the other hand, is derived apparently from the first uses the product was put to—viz., the erasing of pencil and other marks. As a technical term in rubber culture, however, it is better to reserve the word "caoutchouc" for pure chemical rubber. Thus *rubber* is generally spoken of as containing on analysis moisture, ash, resin, proteids, and *caoutchouc*.

Now, while too much of any of the ingredients, especially resin (presuming the rubber to be properly dried down and containing a minimum of moisture), reduces the quality of the rubber, and consequently its value, the chemically pure caoutchouc would be difficult to obtain (except by chemical processes, at considerable cost), would be difficult to preserve, and is hardly what the market requires or expects. A good quality of rubber, dried down to contain 1 per cent. or less of moisture, should contain 91 to 95 per cent. of caotuchouc and 5 to 9 per cent. of all the other items, moisture included, of which not more than 2½ to 3 per cent. is resinous matter.

THE RUBBER-TREE.

In writing for information, as well as in visiting the Kamerunga instituton to see for themselves, many people ask for or speak of THE rubber-tree—not meaning thereby the best or most advocated, but under the impression that there is only one tree that produces rubber of commerce. This is quite a

* The Cultivation and Preparation of Pará Rubber, W. J. Johnson, F.L.S., F.R.H.S., &c.

mistaken idea, for rubber is obtained from many trees of widely differing species, habits, and requirements. A list of the known rubber-producing plants will be given in due course, but would not be of interest here.

Rubber-producing Plants.

Marketable rubber is produced from plants of the three large botanical families—Euphorbiaceæ, Urticaceæ, and Apocynaceæ—which include such trees as some species of the fig, which will be called to mind at once as containing "latex," some tall trees not in the least resembling figs, some creepers, some small plants, and rubber may be obtained from even the underground roots of some plants. Many of these, including all the most important, will be described and, as far as possible, illustrated in these articles.

Do all Milky Secretions contain Rubber?

Another rather common misconception is that all lactics or milky saps contain rubber, which does not by any means necessarily follow. Rubber in latex may be likened to butter-fat in milk. The milk of one cow may be found to have a comparatively high percentage and that of another a very low one. So, to take an example, with the milk of the common wild fig-tree of this country that climbs over and kills out other trees, and that every schoolboy knows, it has been found, so far as experiments have gone yet, that the percentage of rubber is so small as to make its collection unpayable; while the latex of other fig-trees, as the *Ficus elastica* of Northern India, *F. Rigo*, of New Guinea, and even *F. macrophylla*, the Moreton Bay fig, of Queensland, contains quite an appreciable amount. There are many trees that produce a milky secretion, but comparatively few from which rubber can be obtained in payable quantities.

Will Rubber-trees Grow Here?

Will rubber-producing trees grow here? Undoubtedly yes. This has been proved by the trees, now in bearing, at the Kamerunga State Nursery, Cairns, at Mourilyan, and other localities in Queensland; by the experiments at Port Darwin, referred to at the beginning of this paper; and the rubber-trees growing wild in the similar climate, soil, &c., of New Guinea. But perhaps the best answer to this question would be to give the conditions the trees require and under which they grow in their wild state and native countries. This, however, cannot be given in detail on account of the many varieties, details of which will be given as each is separately treated with.

Soil and Climate of Rubber in Native Country.

Rubber-trees are found wild in the tropical forests of South America, Brazil, East, Central, and West Africa, India, Burma, the Straits Settlements, Malacca, and the federated Malay States, &c. The latitudes run from about 20 degs. north to about 20 degs. south, the temperatures from 50 degs. Fahr. to 100 degs. Fahr. (or, indeed, any heat in a moist atmosphere). The soils required are the ordinary tropical forest, or, as we call it here, "scrub," soils, with plenty of leaf mould and humus—by preference alluvial, but not necessarily so. The rainfall, from 30 to 150 in. per annum. In situation, from land almost swampy to dry and well drained; from protected rich hollows to high and dry ridges; and from sea-level to any elevation short of the line of frosts. This is a very general description of the soil and climatic requirements of rubber, and does not apply to any one particular species. While it must not, therefore, be taken as defining the absolute limits under which rubber-trees may be successfully grown, it indicates, as will be seen, a pretty wide scope for its culture. The matter of elevation above sea-level at which rubber can be satisfactorily grown is still somewhat of a debatable one, and much has

still to be learnt respecting the susceptibility of certain trees to the light frosts we experience here, as well as to the returns obtainable in the colder situations, whether due to elevation or latitude.

WILL RUBBER CULTURE PAY?

If rubber-producing trees can be grown here, the next question asked is: *Will it pay?* This also can be answered by turning to other countries, where immense profits are being made and companies are paying tremendous dividends on the invested capital. The very fact of the extensive planting up of rubber throughout the tropical world is in itself evidence of its paying capabilities. As to actual returns, however, from an acre of 200 trees (the usual average), once in full bearing, an average of 2½ to 3 lb. of dry rubber per tree per year at least may be expected, worth not less than 5s. per lb. This equals 12s. 6d. to 15s. per tree, or £125 to £150 per acre gross. The labour necessary for planting and subsequent cultivation is trifling—so much so, that one man could easily manage, say, 25 acres, opened at the rate of, say, 5 acres a year, or could look after such an area once planted until coming into bearing.

How long shall we have to wait? may be asked. The best variety to grow—viz., Pará (*Hevea braziliensis*)—comes first into bearing about the fifth or sixth year, and most other rubbers, except the Rambong (*Ficus elastica*), which takes a little longer, are about the same. In the fifth year, about ½-lb. of dry rubber may expected, or £25 worth per acre, which gradually increases until the tenth year, when the full bearing of 2½ to 3 lb., and possibly more, is obtained. This is almost the slowest of the rubbers to attain the full-bearing period, others being quicker. Pará, however, is surer, and, moreover, continues to increase in output with age and size.

VALUE OF THE PRODUCT.

The value of rubber depends upon quality, and varies from 4s. 6d. to 6s. 6d. per lb., dry. The price is not likely to drop for many years to come through the extension of cultivation or other reasons, as the demand for and uses of rubber are as rapidly increasing, and are more than keeping pace with the output. As electrical appliances, &c., become more used the demand for rubber for insulating purposes correspondingly increases. This, coupled with the facts that no substitute, vegetable or chemical, has as yet been nor is likely to be found for rubber, and that no method of devulcanising rubber has been discovered—that is, no method of using old rubber over again—would point to the probability of the price not being materially reduced before, or for many years after, rubber could be brought into bearing in Queensland.

MARKETS.

The market for any and all the rubber that could be produced from, say, 1,000 acres exists already in this country, and if this area were all in full bearing, producing the 3 lb. per tree above quoted, I have no doubt it could and would be used up by the rubber goods factories—of which several exist in Sydney and Melbourne—in the Commonwealth; and, if not, the world's markets are open to take it all, and more. Nor need the idea of transport appal one, for the freight on goods worth nearly £600 per ton could not be proportionately heavy.

WHAT ABOUT THE HARVESTING?

The question of perhaps the most vital importance to intending producers or planters of a new staple, at any rate in this part of the tropical world, is: *What about the harvesting?* This work consists, as already stated, of scoring or cutting the bark under a similar principle but slightly differing methods, according to age, size, and variety of the rubber-tree. The work cannot be called hard or laborious, though it must be continuous. Since the stems of

the trees only are worked on it is continually in the shade, and in this respect well fitted for the white man in the tropics. Again, it requires common sense, knowledge, and knack rather than mere animal strength or ploddingly laborious effort, which also is in favour of the higher intellectual ability of the white labourer. The harvesting of the rubber crop, within limits, is not confined to one special season, and will, therefore, fit in well with other staples, and afford in a great measure scope for the employment of labour between the harvesting seasons of other staples.

The actual amount that a white labourer could collect in a day as compared with the usual coloured collector has not, so far as I am aware, been worked out, nor have experiments in this country been carried far enough as yet to make any definite statement on this point. It is a generally conceded point, however, that in such work the white man is equal to three ordinary coloured labourers. Records exist of coloured labourers collecting 1 lb. of dry rubber per day, averaging in value, say, 5s. per lb. The returns of 1 acre in full bearing, as also above stated, that may be expected are not less than 600 lb., worth, say, £150, which might be collected in not more than four months' continuous tapping. With the possible returns per acre, therefore, and wages at, say, £2 per week inclusive, there would be a profitable margin, even if only one acre per annum is properly tapped per labourer employed; and if two or more are tapped the returns would, even under the conditions of labour in this country, compare, as they do in other countries, most favourably with any other agricultural product or industry.

WHAT PLANT IS REQUIRED?

What plant shall we need? When the rubber plantation is large and in full bearing more or less expensive machinery for washing, rolling, coagulating, and drying the rubber may be advantageously obtained, but by then the estate will be amply capable of affording it. For starting in a small way the plant necessary is small and not costly. The use of a room or small barn—the room of a house or even enclosed veranda—is necessary. This need not be large, for the coagulating pans, &c., can be laid on tables or low shelves round the room, and the drying rubber itself on higher shelves or wire netting or hessian trays. This room or store, though small to begin with, must, like a small dairy, be capable of being kept scrupulously clean.

A few tapping knives, costing about 2s. 6d. to 5s. each; a few hundred collecting tins, costing 7s. 6d. per 100; several enamel coagulating pans about 1 ft. across; one or two enamelled iron pails or large "billy cans," costing a few shillings each; a rolling-pin, or by preference a small hand mangle, for rolling the wet rubber, &c.; and a tub or few buckets for water, constitute all the plant required for the beginner.

HOW TO OBTAIN SEEDS OR PLANTS.

If this is so, would say prospective growers, *Where and how can I obtain seeds and plants?* As already stated, a small plantation of rubber-producing trees exists at the Kamerunga State Nursery, Cairns, where seed in season and plants at any time can be obtained *in limited quantities*. Seed or plants in large quantities (thousands at a time) cannot be obtained in this country at present, and importation by individuals from any country where either *Hemileia vastatrix*, the coffee leaf disease, or *Phylloxera vastatrix*, the grape vine disease, exists, is prohibited under "*The Diseases in Plants Act of* 1896." Under this Act, however, the Minister has power to himself import should he deem it advisable or necessary. And should any settler contemplate opening on a large scale it would be advisable for him not to attempt the importation of seed, &c., except, for his own safety, under the advice of the department's officers and by communication with the Minister for Agriculture, when no doubt his application would receive every consideration, and after due precautions

necessary for the safety of the country had been taken arrangements made to as far as possible meet his requirements.

MUST CLEAN CULTIVATION BE KEPT UP?

Not less than five years or so for the first returns and nine to ten years possibly for full returns is a long time to wait. Is it necessary that full cultivation be kept up all the time—*i.e.*, the plantation kept clean weeded, scarified, ploughed, &c.? and can auxiliary crops be grown between the rubber-trees? Rubber-trees come into bearing when a certain size rather than at a given age, which size is seldom if ever attained before four years of age, generally five. Hence it is advisable to encourage growth to this size as early as possible. This can be done best and quickest by having ploughable land to plant in and by keeping the clearing scarified and free from weeds. There are, for instance, considerable areas of land that have been under bananas in the North which have gone out of cultivation, from which the stumps, having rotted, very little expenditure would bring under the plough. The soil of such lands, after the shallow cultivation afforded the bananas, will be found after ploughing to have lost practically nothing that the deeper-rooted rubber-trees will require for normal growth. Rubber being an exotic plant, and somewhat delicate as a seedling, cannot be expected to hold its own or thrive if merely put in and allowed to be overrun with the rank indigenous growths of burrs, blady grass, or secondary scrub, but it is not essential to success that the land should be ploughed or even weeded. In new scrub, with the stumps standing, rubber plants may be put out, and will thrive if kept clean for, say, 3 or 4 feet round the hole and the periodical cutting back of excessive scrub growth. Once the rubber-trees are, say, three years old they will begin to form a leaf canopy, and in course of time so shade the ground that other growths will be checked. As time goes on the cost of weeding and cleaning is materially reduced. Undoubtedly the best and safest method in the long run is, if at all possible, to keep the plantation clean from the first.

CAN AUXILIARY CROPS BE GROWN?

If auxiliary crops between the rubber-trees are contemplated, and which are quite feasible and the trees per acre (say, 200, or 14 x 14 feet) readily allow of, the double purpose of keeping the whole plantation clean and of paying expenses of upkeep and possibly even of obtaining returns, is served. As auxiliary crops among rubber in this country may be suggested maize, sorghum, sunflowers, peanuts, rice (hill variety, not requiring irrigation), tobacco, etc., or indeed any tropical cereal excepting other root crops and grasses, for the first year or two, until the shade afforded by the rubber-trees is too great for their successful growth: to be followed by a sowing of some leguminous quick-growing plant, such as pigeon-pea, cowpea, Mauritius bean, or velvet beans, for ploughing in to return to the soil any loss of humus or nitrogen that may have taken place. As more permanent crops, to last for, say, the first five years, and then to be cut or ploughed out, may be suggested cotton, ramie, fibre, and Murva hemp, which latter would, however, require to be carefully plouged out ultimately; and as still more permanent crops of smaller growth than the rubber that would not be detrimentally affected by the shade, to last for ten years or more, I would suggest coffee (taking three years to come into bearing), cocoa (four years), kola-nut (six years), &c.

PLANTATION TO BE FENCED IN.

A young plantation of rubber-trees would require to be fenced in, as the leaves and young plants themselves are greedily eaten by stock. When older, it would still be advisable to keep stock out for fear of damage to the trees by rubbing, knocking, breaking, or horning; also, from the detriment to the growth of the rubber that the presence of grasses would involve.

How to get Information.

One last question that is put to me is: Well, how can I find out all I want to know about this industry? What books shall I get, and where? Information regarding this and almost every other cultural industry possible in this country is far more readily, cheaply, and satisfactorily obtained from the officers of the Department of Agriculture, who are here for the purpose of supplying it and who are thoroughly acquainted with all the conditions pertaining to the country. No text-book on rubber exists as yet for this country, and all books written are in and for certain countries and apply to the conditions obtaining there. Without a thorough knowledge of the conditions underlying the advocacy of certain cultural or other operations, mistakes such as have been made before in this country in new industries, costing the planter dearly, are apt to be made. Correspondence is invited, and questions will be answered and advice given from the office of the Instructor in Tropical Agriculture, Cairns. The time to learn from books is when the plantation is well underway and the tapping seasons approaching, by which time the planter will have some experience of the various climatic and other conditions governing the operations, and will be able to temper and modify the suggestions he may get from books to suit his own requirements. For Pará rubber alone, the best variety and the principal one advocated for Queensland, the best text-book would seem to be "Pará Rubber," by Herbert Wright, published in Ceylon (Messrs. A. M. and J. Ferguson, Colombo), costing about 12s. 6d. For rubber in general, including other varieties, no text-book can be as yet suggested. Those wishing to keep up to date or see what is being done in other countries could not do better than obtain such periodical as "Ceylon Tropical Agriculturist," "Tropical Life," &c. In these, however, nowadays very little reference to the elementary matters and preliminary work of opening up plantations will be found. The information, articles, and discussions in these being fairly well advanced and often technical in expression, may be found, however, like books, while by no means incorrect, nevertheless apt to be misleading to the novice and beginner.

I trust that these answers to questions, which have all been put to me at some time or other, being in greater detail than is possible by letter, may be of use, and tend to show that the industry is worth and worthy the consideration of the Government and settlers alike, and that it is "worth while" from every point of view.

Subsequent Articles.

It is suggested in subsequent articles to deal in detail with the different varieties of rubber, their propagation, culture, treatment, and returns, &c., commencing with Pará, the variety suggested herein. It must, however, be borne in mind that the foregoing has been made as far as possible quite general and embracing a number of varieties of rubber-producing trees, and therefore is not to be taken, except where especially stated, as referring to any one variety in particular.

ARTIFICIAL RUBBER.

It is generally taken for granted that no artificial rubber will be discovered which will drive natural rubber out of the market. Dr. Pehr Olsson-Seffer, the tropical expert in charge of La Zacualpa Botanical Station, located on the west coast of Chiapas, Mexico, who is also the editor in charge of the Mexican Investors' Department of "Tropical Agriculture," is firmly of the opinion that no satisfactory substitute will be found, and, in taking this attitude, we must believe that he is not only influenced by his own studies, but is expressing the opinion of the scientific world.

That this opinion is pretty generally accepted is shown by the enormous amount of capital that has been placed in rubber plantations in Ceylon and other parts of the far East, as well as in tropical Mexico.

The discovery of the guayule shrub is a matter of great importance to the rubber world, because of the fact that it gives a cheaper substitute for the lower-grade rubber, but it is not an artificial substitute. Many scientific men are experimenting along the line of producing artificial rubber, but as far as we are informed, no satisfactory substitute has been found. It is true that artificial substitutes have been discovered, but we repeat that none have proven satisfactory.

One of the latest discoveries in this line is obtained by treating cereals with phyalin.

Six grades are prepared from a liquid solution suitable for waterproofing to a hardness available for golf balls. In the latter, the new rubber is credited with the lightness of cork and the toughness of chilled steel. The intermediate grades are expected to be serviceable for tires, tubes, linoleum, and slabs for pavements.

Of course, very much is possible, but we must remain sceptical as to satisfactory substitutes being found, except for certain grades and classes of goods. We shall await the results of the experiments which investors are making, but we would not advise our friends interested in the growing of rubber to at once give up their plantations.

We remember the time when aluminum was to take the place of iron, and to be manufactured so cheaply as to drive iron from the market. A friend had the chance to acquire the famous Durango iron mountain at the time, but because of what he read concerning the coming universal metal—aluminum—he did not avail himself of the opportunity. He has wished many times since that he had done so.

Rubber and iron are probably in the same class as to permanent usefulness in the industries.—"Mexican Investor."

COTTON BOLL WORM.

(In continuation of the interesting articles by Mr. D. Jones on the value of trap crops as a protection against the cotton boll worm, we publish the following extracts from Bulletin No. 29 of U.S. Department of Agriculture.)

REPORT ON THE BOLL WORM OF COTTON.

By F. W. MALLY.

TRAP-CORN EXPERIMENTS.

Experiment 1.

A portion of a plantation owned by Mr. Dan Nicholson was kindly set aside by him for a trap-corn experiment. The field was rich Red River bottom land, bordered on the east by a large forest, but surrounded on all other sides by cotton fields. Five rows were left vacant on the outer edge of the field, then eighteen rows of cotton planted, four more rows left vacant, then eighteen of cotton, and so on. The cotton was planted at the usual time. Two rows of each of the vacant strips were planted in corn 4th April; 7th May this corn averaged about 1 ft. in height. No boll worms were found in the buds of the plants, though in a field of corn some 300 yards away, which had been planted at the usual time, a few were collected. This field of early-planted corn was near the garden, and was surrounded on two sides by fences which were thickly grown over by flowering plants and dewberry vines. As no worms were found some distance from the edge of the field, it was evident that the first brood of moths had been somewhat attracted to the adjoining blossoming plants near the hedge and in the garden, and had confined their depredations

to the outer edges of the field. This becomes an important factor when considering the feasibility of resort to killing the first brood of worms in the buds of corn by crushing. This does not apply to larger areas of corn where similar attractions are not near at hand. The trap corn was not so situated, but was in the midst of a large plantation, away from such early inducements.

On 3rd July, a visit to the trap corn was made. It was, and probably for some days had been, silking profusely just as the second brood of moths was issuing. By 6th July the first planting had passed its prime in point of silking, though still in fit condition to receive the deposition of many eggs. At the time of the 3rd July visit the following study of the number of larvæ found in the young ears was made.

Plants.	Ears.	Larvæ.
1	2	6
2	1	1
3	2	4
4	2	3
5	2	7
6	2	5
7	2	3
8	1	1
9	1	7
10	2	2
11	1	2
Total	18	41

The larvæ at this time were nearly all less than half grown, only two of the number being nearly grown. These two were found alone in the ears of plants 2 and 8. In the ear of plant 9, which contained seven larvæ, all less than half grown, two were discovered being eaten by others.

By 25th July, the second planting in the remaining two vacant rows was in its prime, but by 1st August had passed its best condition. The time of its greatest attractiveness covered the period of the issuance of the third brood. This brood deposited upon the fresh silks to such an extent as to produce an extremely crowded condition, for the larvæ expected to find food upon such a limited number of ears. Many ears were examined, and all presented so nearly the same condition that only a few counts were made. These were—

Plant.	Ears.	Larvæ.
1	1	10
2	2	8
3	3	15
Total	6	33

At the time of this examination—1st August—the larvæ were still all very small, probably two-thirds having never moulted. In addition, the ears above noted for the larvæ seldom bore less than six to a dozen fresh eggs upon their silks, often ranging from a dozen to twenty. In the same field, in ears in which nearly-grown larvæ were found, only a few, if any, younger ones were present. This indicates that the crowded condition led the larger and stronger ones to prey upon the others, thus giving the victors more room and food.

The ears of the first planting had now hardened, and no larvæ were found in them, and no fresh eggs were being deposited on their leaves and husks. Eggs were still being deposited upon the plants of the second planting. The cotton between the rows of trap corn was carefully examined during the egg-laying period without finding eggs or bored bolls, even in the rows immediately adjoining those of the trap corn.

Experiment 2.

Through the kindness of Mr. A. Curtis, of Curtis, La., a large and fertile tract of land, also in Red River bottom, was placed at my disposal for experimental purposes. The cotton was planted at the usual time, one row for every fifteen being left unplanted. This one row was planted in corn, 9th April; 7th May the rows of young corn were examined, but no larvæ were found in the plants. A small field of crop corn, planted earlier, and adjoining the experimental field on one side, had a few worms in the buds of some of its plants. The second visit was made 3rd July, when the corn was found in splendid condition for egg deposition. The following studies were made of infested ears:—

Plant.	Ears.	Larvæ.
1	2	5
2	2	2
3	2	10
4	1	7
5	1	3
6	1	1
7	2	3
8	1	1
9	1	3
10	2	7
Total	15	42

A similar study was made of the adjoining small field of rapidly maturing trap corn, with the following results:—

Plant.	Ears.	Larvæ.
1	Bored*	0
2	Bored	0
3	Bored	0
4	1	1
5	2	2
6	1	1
7	1	0
8	1	0
9	Bored	0
10	Bored	0
Total	11	4

Inasmuch as eggs were found quite plentiful upon the trap corn, and none were found upon the other, it is apparent that the moths had chosen between the two.

The number of plants and ears such as the females would readily deposit upon was counted. One row contained 148 plants, with 267 ears. Each of the remaining rows was of the same length (about 10 or 15 rods), and contained approximately the same number of plants and ears. From the count of the number of worms in the ears of this trap corn, as above given, an average of 2·8 worms per ear is derived. Therefore, the above row contained about 747·6 worms. For the eight rows of trap corn in this field, this makes 5,981 as the approximate number of worms trapped. This leaves out of consideration the unhatched eggs found in the silks at that time.

23rd May, a second trap was made, in a field immediately to the right of the first experimental field. By 6th July it had not yet tasselled, though it was badly infested with another species which was feeding in the buds, just as the boll worm does.

* By "bored" is meant that a worm had been in the ear, but had left, either for another ear or to cupate.

Later, about the 1st of August, the second experimental field has silked, and was well stocked with boll-worm eggs, many of which were parasitised. The larvæ were plentiful in the ears, and as nothing of further interest could be attached to the experiment, Mr. Curtis cut the corn and fed it for forage.

Experiment 3.

(Mr. J. H. Fullilove's plantation.)

Corn was planted 13th April; 7th May it was still small. No boll worms in the young plants. Two hundred yards away was a field of corn which had been planted much earlier. In this a few young boll worms were found. 3rd July, the ears of the trap corn were badly infested with boll worms, and many unhatched eggs were upon the silks. The conditions in general were much the same as in the preceding, and need not be repeated in detail.

Experiment 4.

(Mr. S. J. Ziegler's plantation.)

One field was rather more upland and less favourable for a good growth of late-planted corn. The first planting of corn was 9th April; 24th April the corn was from 4 to 6 inches high, but contained no boll worms. It tasselled and silked subsequently, and the ears were badly infested.

29th June, the second row was planted; 28th July the plants were 10 to 15 inches high, and had boll-worm eggs upon the leaves. The weather had been very dry during July, and the corn made an unsatisfactory growth, few plants producing ears with large flowing silks.

In another of Mr. Ziegler's fields corn was planted 19th May; 28th July this was in fine silk. By actual count the silk of a single ear was found to have twenty-five unhatched boll-worm eggs. Most of the silks had only about a dozen eggs, with from three to six larvæ in the ears.

Late in July notice was received from Mr. John Glassell, junr., a leading planter at Rush Point, La., who had read the recommendations given by the division upon the boll-worm question, and had prepared to test the suggestion. By his invitation the plantation was visited 25th July, and a complete verification of our own experiments proved to be in waiting. Mr. Glassell had planted corn at the time of the second hoeing, when the cotton was about knee-high, or, as he informed me, about 20th May. At the time of the visit the third brood of moths was fairly issuing. The trap corn was in fine silk, and the record of a few of the many ears examined will suffice to indicate what they were accomplishing. One ear, 11 larvæ, 7 eggs on silks; another ear, 6 larvæ, 10 eggs on silks. The closest inspection of the cotton plants surrounding this corn failed to reveal any traces of boll-worm injury. Various fields of corn near by were examined, but no boll-worm eggs were found. The fresh silking corn was nearly in the centre of a number of these fields, and seemed to be receiving almost the entire egg-deposition of the issuing brood in that immediate locality. Mr. Glassell enthusiastically accompanied your agent during all the observations, with a view of thoroughly informing himself of the facts, and enabling himself to estimate the value of this method of protecting cotton. Subsequently, he continued to make close observations, and reported himself as being well satisfied with the remedy. In this connection it may also be stated that much valuable corroborative evidence was obtained from Mr. S. B. Mullen, of Harrisville, Miss., who had been advised of the trap-corn experiments. He arranged several small fields to make a test of the idea, and all of his reports by letter are in entire accord with what has already been stated.

The plantations thus far considered were bottom lands. The cotton in and about trap-planted fields was practically free from boll-worm injury. This could in a measure be said of other cotton fields in the valley, because the

boll worm did not appear in destructive numbers during the season. This in reality does not affect the facts recorded for the corn experiments, and their significance relative to the moths which did appear remains the same.

In the "hill country" of Louisiana and portions of the Mississippi, away from the river valleys, the boll worm is not noticed or feared much, except during very destructive years, when it spreads from the bottom lands. A small farm in the uplands, west of Shreveport, was prepared for experiment in much the same way as those in the valley. Corn was planted 16th May; by 16th June it was knee-high, but no worms were found. 9th July corn was tasselling and beginning to silk, but as no moths appeared in this locality no eggs were found. To trap the first brood requires corn in silk from about 15th May to 1st June. This is too early a date to be reached by the yellow or Dent corns. In its stead a sweet corn, commonly planted in the South for table use, meets the requirements. This corn has passed silking, and was in good roasting ears before the 1st of June. Some of the studies made upon it are exhibited in Table II., which shows how badly it was and had been attacked. At the time of the count many unhatched eggs were still to be found upon the silks. Care must be taken, however, not to estimate the abundance of the boll worm and the extent of its injuries from such examples. The Dent corns also make an unsatisfactory growth when planted late enough to bring silking about the 1st of August. In its stead the sweet corn again meets the conditions.

The plan, therefore, to be recommended to the planter for using the trap-corn method of protecting his cotton against boll-worm injury may be summed up up as follows:—When planting the cotton, leave vacant strips of five rows for every twenty-five of cotton to be planted in corn. At the earliest possible time plant one row of this with an early-maturing sweet corn. It should not be drilled in too thickly, since only a minimum number of plants and ears is desired. During the silking period of this corn frequent careful examinations must be made as to the number of small white or brownish banded eggs, hardly larger than a pin head, found upon them. As soon as no more fresh white eggs are found each morning, the silks and ends of the ears should be cut away and fed or burned, in order to destroy the young worms and the eggs. A few eggs may be on the leaves of the plants, and since no more growth is to be made, they also should be cut and taken from the field. There is no reasonable objection to this method of handling the first planting, since the natural enemies are not yet numerous, and the egg parasites appear in greater numbers during the egg-laying period of the next brood. The next planting should be three rows of Dent corn, drilled in late enough to bring the silking period about the 1st of July, or a little later. These rows catch immense numbers of eggs and larvæ, but should be left to mature, in order that the natural enemies which parasitise the eggs and prey upon the larvæ may not be destroyed. Furthermore, the cannibalism previously discussed, which occurs in this corn under such crowded conditions, reduces the number of worms reaching maturity to a minimum, and these can well be allowed to escape if the natural enemies be saved thereby. To trap these escaped individuals, the fifth and last row of the vacant strips should be planted to sweet corn, at a time calculated to make it reach full silk about 1st August, when the moths begin issuing again. This expedient allows the planter to save the second planting as a crop. The corn produced in this way is large enough in quantity to pay for the expense of cultivation and management, and the sacrifice made in cropping the five rows with corn instead of cotton. However, it must be understood that this is immaterial so long as protection is afforded to the surrounding cotton. The last row of sweet corn should be carefully watched. If it is found that a great many eggs are parasitised, a fact which is indicated by their uniform grayish or blackish colour, it may be as well to allow it to mature as before, and thus save the parasites. If this condition is not found, the corn should be cut and taken from the fields as soon as it shall appear that no more eggs are being deposited.

If the first two plantings are well managed, the number of the earlier broods will be so reduced that the August brood will not be capable of inflicting great injury, and in less infested regions the third planting may even become superfluous. It is not necessary or advisable to crop the entire plantation with corn and cotton, as recommended. The end will be attained if 5-acre strips of alternate corn and cotton be planted for every 50 acres of cotton. For less infested regions 5 acres of trap corn for 75 or 100 acres of cotton may suffice to insure the same protection. By a judicious arrangement of the trap crop and cotton lots the 5 acres of the former may, in the same proportions as above given, be made to act as a protection for just twice the number of acres of cotton above designated. To illustrate this, the accompanying diagram—Plate 1.—(diagram consists of a table showing spaces and positions of trap corn and cotton)—for a plantation of 1,060 acres is presented, and is suggested as probably the best plan for placing the trap corn to the best advantage and insuring the greatest immunity.

On 27th May, in company with Prof. Jerome McNeill, a trip was taken to Rustan and Calhoun, about 60 miles east of Shreveport. This region is quite heavily wooded, mostly hilly and broken. Along the entire route, often passing beyond the Red River Valley, the crops were at least three weeks behind those of the river bottoms. A similar difference occurs in Texas. Southern Texas is about two or three weeks earlier in point of season than the northern portions. From this great extent of the cotton-producing regions, and the variability of the conditions in different localities, it becomes advisable to waive all specific recommendations, and depend upon the planter to determine the exact time during which the broods of moths to be feared deposit their eggs in his immediate locality, and manage his trap corn accordingly. By way of emphasis, and to avoid being misunderstood by farmers, it may be remarked that the time of appearance and egg-deposition of the moths is the point in question, and not the worms. Should the farmer base his calculations on the latter, he will fail entirely, since the females will have issued a week or ten days previously, and have laid their eggs upon some other host.

The regular crop corn can be protected to a certain extent if care is taken to plant it as early as is expedient, calculating to have it beyond its prime in silking before 10th June. If rows of corn near by are planted at a time to bring silking about 1st July, the protection to the corn crop will be still more complete. For this reason late-planted corn which silks about 1st July is much more eaten by boll worms than that planted earlier.

It has already been intimated that the earliest appearance of boll worm injury are noticed in patches of early sweet corn in the numerous small gardens throughout the cotton country. These pratically form a breeding ground for the first brood. The evident importance of hand-picking and destroying the larvæ in these patches is hardly to be over-estimated; in fact, it may be quite as practicable to recommend that these small patches be planted with the intention of destroying the corn as soon as an examination of the ears shall show them to be well stocked with worms and eggs. An early planting of sweet corn as a trap crop in cotton will divide the attack upon the gardener's corn intended for the market, and meet this source of complaint as well.

As has been previously noted, the worst infested boll-worm districts seem to correspond to a certain extent with those regions in which the proportional area of corn is greatest. By some this is put forth as an objection to the trap corn method. The greater acreage of corn results in a greater number of individual ears in which the worms can mature without inducing cannibalism among them. For this reason the first broods succeed in maturing a greater number of individuals, which leave the corn when it matures and attack cotton. At the time, therefore, when the trap corn matures, and the adults

of the destructive brood begin appearing, the properly managed rows of trap corn will be in suitable condition, and will attract to themselves the greater portion of the egg deposition. The objection, therefore, is not well taken, but rather, in view of the greater number of the August brood resulting, the adoption of the method recommended becomes still more imperative. In such districts as those just mentioned, it may be advisable to cut out the trap corn and feed or burn it, if examination proves that the egg parasites and natural enemies are not especially abundant upon it. These points each planter must necessarily determine for himself, and act accordingly.

COTTON-MILLS IN JAPAN.

Whether the Ipswich cotton-spinning mill will eventually be resuscitated and turn out a paying speculation or not is a matter for experts to decide. The Ipswich mill is quite up to date, and contains all the machinery needed for spinning and turning out large quantities of cotton goods. In the United States of America the number of cotton-mills is increasing so rapidly that it is only a question of a very short time when America will have very little raw cotton available for export. Those mills are not run by cheap coloured labour, the operatives receive the full wages current in the various cotton districts. In Queensland we have all the accessories needful for a big industry, both in the growing of cotton, manufacturing cotton goods, oil-making, and cotton seed oil cake production. There are railways throughout the coastal cotton belt, as well as water carriage. The raw material pays better to grow than wheat, maize, or potatoes, or even sugar, yet it is hard to get the farmers to put in even a small area of cotton. The great profits of cotton-spinning are shown in the following article on cotton-mills in Japan, which we take from the "Indian Trade Journal":—

A VALUABLE REPORT.

Mr. W. A. Graham Clark, a special agent of the United States Government, has been making a study of the development, present position, and prospects of the cotton-spinning and manufacturing industry in Japan, and has sent from Tokio a valuable report, which has just been published in America. Although it is written primarily for the information of American cotton manufacturers and exporters, the subject of the report so closely concerns the textile industry generally that we propose to reproduce it in these columns almost *in extenso*. A portion of the first instalment is given below:—

I.

Cotton manufacturing is the most important single industry of modern Japan. Some of the brainiest, most enterprising men of the Empire control the factories; the largest banks are heavily interested in the business, and behind the young industry is the whole force of the paternal Government urging it on. There are 49 cotton-spinning companies in Japan, operating 85 mills. All of the 85 mills make yarn, and 14 also manufacture cloth. On 30th June there were, according to the reports of the Japanese Cotton Spinners' Association, 1,450,949 spindles, of which 1,373,709 were ring and 77,240 mule; also 133,052 twister spindles and 9,136 looms. The capital of these 49 companies was 21,966,675 dollars, the capital paid in 18,675,479 dollars; the reserve fund 6,271,323 dollars, the fixed capital (permanent investment) 17,746,271 dollars, and the amount of fire insurance carried on buildings and machinery was 15,992,900 dollars. The total liabilities of the 49 companies were 6,598,836 dollars. There were employed 14,369 men, at an average wage of 36·17 sen, or 18·08 cents (9d.) a day, and 61,462 women, at an average wage per day of 22·42 sen, or 11·21 cents a day. This gives six months' total wages of operatives at 948,832 dollars, or the yearly wages as about 2,000,000

dollars. The mills report a total of 5,370,931 dollars as operating cost of producing 485,577 bales of yarn, and about 71,168,497 yards of cloth. To produce this there were consumed 221,994,790 lb. of cotton. There was reported a total net profit of 3,980,984 dollars for the first six months of this year; 1,200,014 dollars was charged off to depreciation of buildings and machinery, and, after paying about 10 per cent. average semi-annual dividend, 940,276 dollars was carried forward.

HIGH DIVIDENDS.

There was a larger margin between cost of cotton and selling price of yarn in 1905 than the Japanese mills had ever experienced before. The large margin that existed in 1905 has continued into 1906, with continued prosperity to the mills and big dividends; but cotton and yarn prices are now tending closer together. During 1905 every cotton mill paid dividends ranging from 10 per cent. to 40 per cent. The Settsu Spinning Company, at Osaka, declared a 40 per cent. dividend. One company—the Tokio Grand Yarn Company—paid even more than this, declaring a dividend of 70 per cent. The average dividend paid by the 49 cotton-mills in 1905 was 22·1 per cent.

The price of yarn from the beginning of 1903 to March, 1906, showed a steady increase, but it has since experienced a decline. In January, 1903, No. 20's warp Japanese yarn sold for about 11½ cents a lb., and in March, 1906, reached the high-water mark of 17½ cents, since which it has dropped to about 15½ cents. In the same time the price of Indian Broach cotton, that was about 9¾ cents a lb. in January, 1906, rose to 14½ cents in April, 1904, dropped to 8¼ cents in February, 1905, and is now about 10½ cents. As the majority of the cotton used is Indian, and the majority of the yarn made is 16's and 20's, 1905 was the most prosperous year that the mills have had.

SPENCE'S COTTON.

In August last year we published Mr. Spence's account of his discovery of a variety of cotton-tree indigenous to India, producing a cotton which would, he wrote, revolutionise the cotton cultivation of India ("Queensland Agricultural Journal," Vol. XVII., p. 109). We now have a further account of this apparently valuable plant, given in the "Indian Trade Journal," as follows:—

SPENCE'S COTTON.

ASCERTAINED LENGTH OF STAPLE, 1¼ INCHES.

Last year it was announced that Mr. Spence had grown at Deesa a kind of tree-cotton from which excellent yarns of high count had been produced and successfully woven. In order to stimulate interest in the matter, samples of these yarns and textiles were obtained by the Commercial Intelligence Department, and were exhibited at Simla and Calcutta in substantiation of the published statements. None of these statements contained an exact botanical description of the plant grown by Mr. Spence; and, in pursuance of his efforts to interest the public in the matter, the Director-General of Commercial Intelligence applied to the Government of India in the Department of Revenue and Agriculture for such a description for publication in the "Indian Trade Journal." In response to that request, the Inspector-General of Agriculture furnished a description, written by Professor Gammie, but which, as now appears, related not to actual specimens of the plants grown by Mr. Spence, but to the variety Bourbon, of which those plants are a form. It was there stated that the lint was "fine, scanty, ⅝-inch long." This description was published in the "Indian Trade Journal" of 13th December, 1906, in order to facilitate reference and complete the record in the matter, and it was considered by Mr. Spence to be damaging, and likely to injure his trade. He,

therefore, through his solicitors, called upon the Government of India to withdraw the description, and he forwarded correspondence which showed that there was reason to doubt whether the published description was really applicable to the cotton in question. A notice was accordingly inserted in the "Indian Trade Journal" of 10th January, 1907, to this effect, together with an intimation that specific inquiries were being made as to the nature of any inaccuracies in the description.

These inquiries were undertaken forthwith. Mr. Spence's solicitors were asked to furnish an authoritative botanical description of the plant grown by their client; and they replied that he possessed no such description, but would show the plant to a professional botanist to be deputed by the Government. It was arranged that Professor Gammie should visit Deesa for this purpose, and his report has now been received. The part relating to the staple is as follows:—"The cotton is a form of the variety known as Bourbon in India. It differs from that described by me" [in the account published in the Journal of 13th December, 1906] "only in these points: (*a*) the stems and branches have a markedly claret or dark-red colour, which is most evident in the young plants; (*b*) the staple seems to average $1\frac{1}{4}$ inches, against that of $\frac{5}{8}$-inch in my variety."

The latter figure applies to the Bourbon cotton hitherto known, and was published in the article of the 13th December. It is, therefore, desired to give the fullest publicity to the facts now ascertained by Professor Gammie from personal examination, and to point out that the production of a tree-cotton having a staple of the length indicated is an event of very considerable importance.

RAMIE FOR QUEENSLAND.

We have received a circular and samples of ramie fibre from Mr. Edwards-Radclyffe, the now well-known zealous advocate of the ramie industry in British colonies. Whilst we have no doubt that the plant will thrive most luxuriantly in Queensland on the rich coast lands, we yet cannot subscribe to Mr. Radclyffe's assurance that the cultivation of the plant will prove remunerative in this or any other State of the Commonwealth, under the present labour conditions. The editor of the "Agricultural Bulletin of the Straits and Federated Malay States," who must be credited with an intimate knowledge of the cost of agricultural products, the result of cheap coloured labour, declares that ramie is far from a cheap plant to grow. It requires, he says, a good deal of labour, good soil, and heavy manuring to make it grow well at all, and he adds that it may well be doubted that ramie can be produced in any country where labour is not excessively cheap at much less than £30 per ton. Mr. Radclyffe says it may be grown almost anywhere at a cost of less than £7 per ton, and can be sold at £40. Here it is that those unacquainted with the business are liable to go astray. Ramie exists in three forms—*i.e.*, the stems, the ribbons, and the finished produce of the ribbons. If it costs £7 per ton to *grow* the stems, how much does it cost for subsequent operations, such as decorticating the stems, scraping and degumming the ribbons, &c.? This is what is not clear to the ordinary mind. If the finished article can be produced at the small cost of £7 per ton, what is the reason that manufacturers are so eager to pay £40 per ton for it? Very little is to be found in any of the accounts of ramie of the cost of the cultivation. It is variously stated that one coolie can keep in order 2 to 3 acres of land, but we have nothing on which to base an estimate of the cost of harvesting and preparing the crop.

Some years ago, Mr. L. Wray, junr., prepared for the Perah Government all available information respecting ramie, its cultivation and preparation. He showed that the final cost of the ribbon would be 91·97 dollars per ton, or 67·98 dollars per acre. Now, as Sir Daniel Morris pointed out in a lecture

Plate XV.

A Plant of Rhea (*Bœhmeria nivea*) Over-matured.

delivered in 1896 on this industry, it does not appear that more than £7 (67·20 dollars) per ton of ribbon can be depended on, and as by Mr. Wray's estimate it would cost 91·97 dollars to grow and prepare one ton, it would appear that there is a loss of 4·77 dollars per ton, or 18·30 dollars for each acre of cultivation. For full information as to yield of stems, cost of cultivation, production of fibre, profit or loss to the planter, we refer our readers to an exhaustive article in the issue of this Journal for January, 1898, page 45.

Since the above was written, we have read a very interesting account of the rhea industry in India, by Bernard Coventry, Director of the Agricultural Research Institute, Pusa. As we have so many inquiries concerning the advisability of planting ramie on a large scale in Queensland, we have taken the liberty of reproducing the illustrations and letterpress of Mr. Coventry's article which appeared in the January number of "The Agricultural Journal of India." The very reasonable and impartial evidence here given will, we feel sure, be very acceptable to our readers:—

RHEA EXPERIMENTS IN INDIA.

By BERNARD COVENTRY, Director, Agricultural Research Institute, Pusa.

Ramie, rhea, or China grass are the names under which this fibre is known. So much has been written about it in recent years, and success has so often eluded the grasp of the experimenter, that it is with some hesitation I am induced to add to the literature already existing. As, however, interest in the fibre appears to be reviving, the moment would seem opportune for an account of its position in India at the present time.

Rhea is not indigenous to India, as is very commonly supposed, its native habitat being China, but it crept into India through Burma and Assam, and became established for a time in parts of East Bengal, where in certain localities near Rangpur it may still be found. It, however, never became an important industry, but was grown in very small patches, its use being confined to the making of fishing lines and nets. The cultivation of rhea as an indigenous industry need not, therefore, detain us.

EARLY EXPERIMENTS.

Throughout the early half of the last century numerous efforts were made by the East India Company to introduce rhea as a textile staple, and, later, the Indian Government considered the fibre of such importance that in 1869 two prizes of £5,000 and £2,000, and again in 1877 prizes of £5,000 and £1,000 were offered for machinery or processes by which the fibre could be prepared in such a way that it would meet the requirements of the market. Competitive trials were made at Saharanpur in 1872 and 1879, but no machine was found to satisfy the conditions of success. All these endeavours failed, and the Government's offer of prizes was eventually withdrawn.

Experiments were also carried out by several European planters and companies. The Madras Presidency seems to have been selected for the most important of these. Putting aside experiments carried out on a small scale with hand decortication (for it appears useless to consider this mode of operation, owing to its cost), I shall confine myself to mentioning two important attempts, the one carried out by the Glenrock Company, Limited, between the years 1884 and 1889, on their property at Pandalur, in South-east Wynaad, and the other by Messrs. Finlay, Muir, and Co., on their Reading Estate, in Southern India, from 1887 to 1894. The Glenrock Company planted some 400 acres in the forest slopes below Pandalur village, and about 100 acres at Kullar. Two methods of decortication were employed, one by the Death and Ellwood machine, another by steaming and removing the cuticle by hand, known as the Fremy system. According to Mr. Minchin, the manager of the company, who was specially brought out from England, "the growth of the rhea was all that could be desired; as many as six cuttings of stems were

obtained in the year, where assistance could be given to the plants by irrigation. Without irrigation, at Pandalur, three cuttings were obtained between the months of June and November, during which months the rainfall is about 100 inches in all. The best out-turn from one measured acre in 1886-87 under irrigation during the dry months was six cuttings:—

1,384 lb.	of stems	(8 stems to the lb.),			about	11,000 stems
2,028 lb.	,,	(8	do.	)	,,	16,000 ,,
4,446 lb.	,,	(5	do.	)	,,	22,000 ,,
4,904 lb.	,,	($6\frac{1}{2}$	do.	)	,,	30,000 ,,
3,660 lb.	,,	($9\frac{1}{2}$	do.	)	,,	25,000 ,,
1,605 lb.	,,	(15	do.	)	,,	24,000 ,,

18,027 lb. (8 tons) weight of stems in the year, about 128,000 stems." The company obtained only $3\frac{1}{2}$ per cent. ribbons by the Death and Ellwood machine, and from 5 to 6 per cent. ribbons by steam decortication, according to the Fremy system. The price realised is not mentioned, but we find it recorded that "the fibre obtained at the price ruling did not pay for the cost of production, and accordingly the cultivation was given up." On the Reading Rhea Fibre Estate the experiment was made on a fairly extensive scale by Messrs. Finlay, Muir, and Co. The highest yield of green stems was 64 cwt. 3 qr. per acre from one cutting, from which about 7 per cent. of dry ribbons were obtained, but this was found to be an unprofitable return, and this experiment was also abandoned. These seem to be the only two attempts carried out in India on any serious scale until the more recent enterprise started at Dalsing Sarai and other indigo concerns in Behar, under the auspices of the Bengal Rhea Syndicate, Limited, with which I shall deal later.

CAUSE OF FAILURE.

The Glenrock Company's enterprise failed, not so much from any defect in the cultivation of the plant, but because the yield of dried ribbons obtained by the Death and Ellwood machine was only $3\frac{1}{2}$ per cent., and by the Fremy process 5 to 6 per cent. It is known that the yield of dried fibre on a given weight of green stems is 5 per cent. Present means of decortication generally give about 3 per cent., of which one-third is gum, leaving 2 per cent. of pure fibre. When we are told that the Glenrock Company only succeeded in extracting $3\frac{1}{2}$ per cent. of "ribbons," which we know to contain only 30 per cent of fibre, the rest being cuticle and gum, it is easy to understand how the enterprise failed, for out of a possible total of 5 per cent. scarcely more than 1 per cent. was actually obtained. The yield from the Fremy system of steaming was a great deal better, for 5 to 6 per cent. of "ribbons" appear to have been got, or say, 2 per cent. of fibre. This approximates more nearly to the results given by the Faure machine at Dalsing Sarai, but the expense of the Fremy system must have been great, for otherwise there seems no reason why it should not have been persevered in.

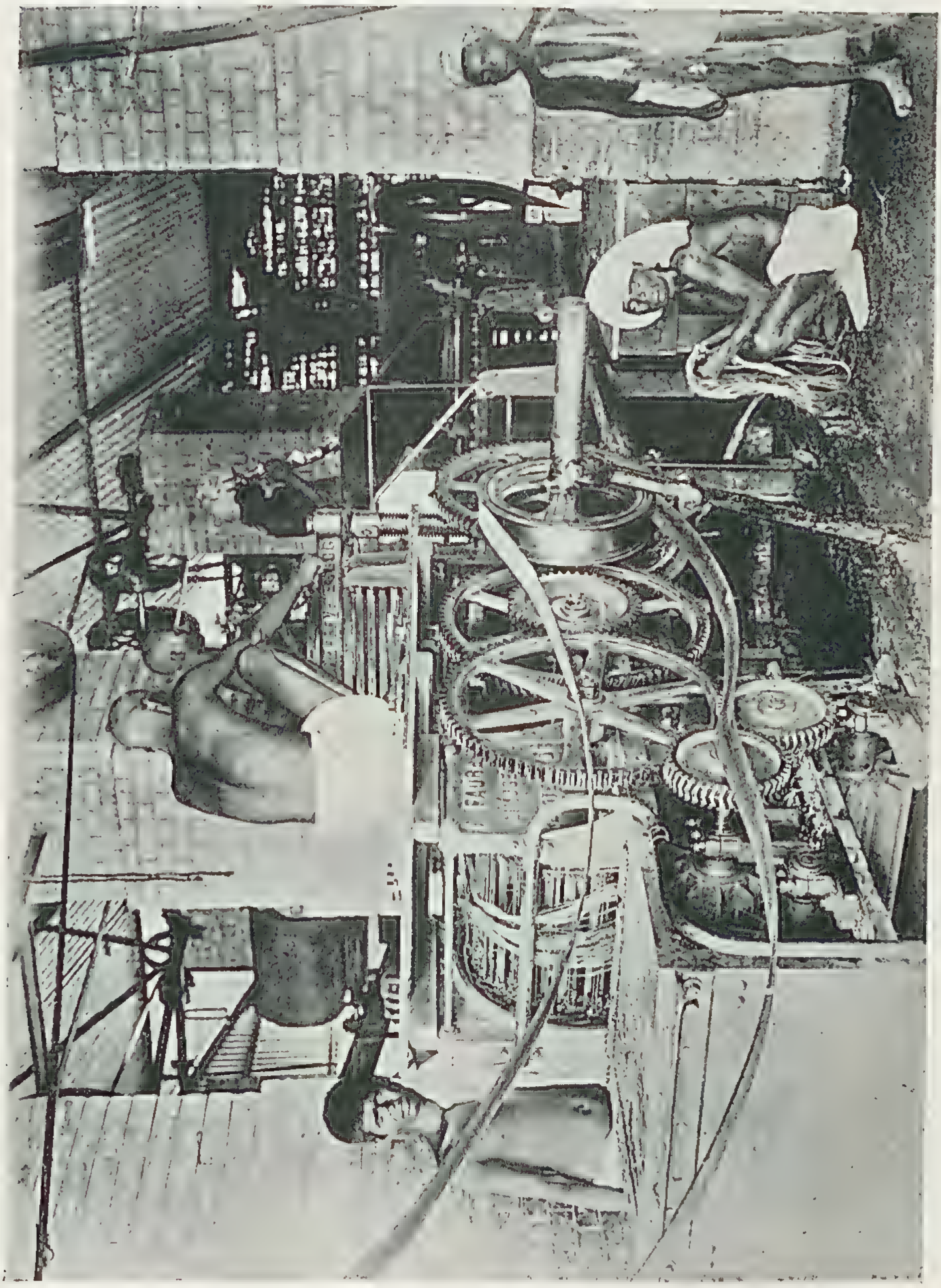
EXPERIMENTS IN BEHAR.

The decline of the indigo trade induced the indigo planters of Behar to seek new enterprises for their capital, and in 1903 eight concerns placed a portion of their lands under rhea. At the same time a company of Calcutta merchants, styled the Bengal Rhea Syndicate, Limited, undertook to supply the Faure machine for the decortication of the plant, and to ship and sell the produce. Contracts were entered into between the company and the concerns on joint terms, the principles of which are that the company shall supply the

Plate XVI.

The Faure Rhea Decorticator.

Plate XVII.



The New Faure Rhea Decorticator.

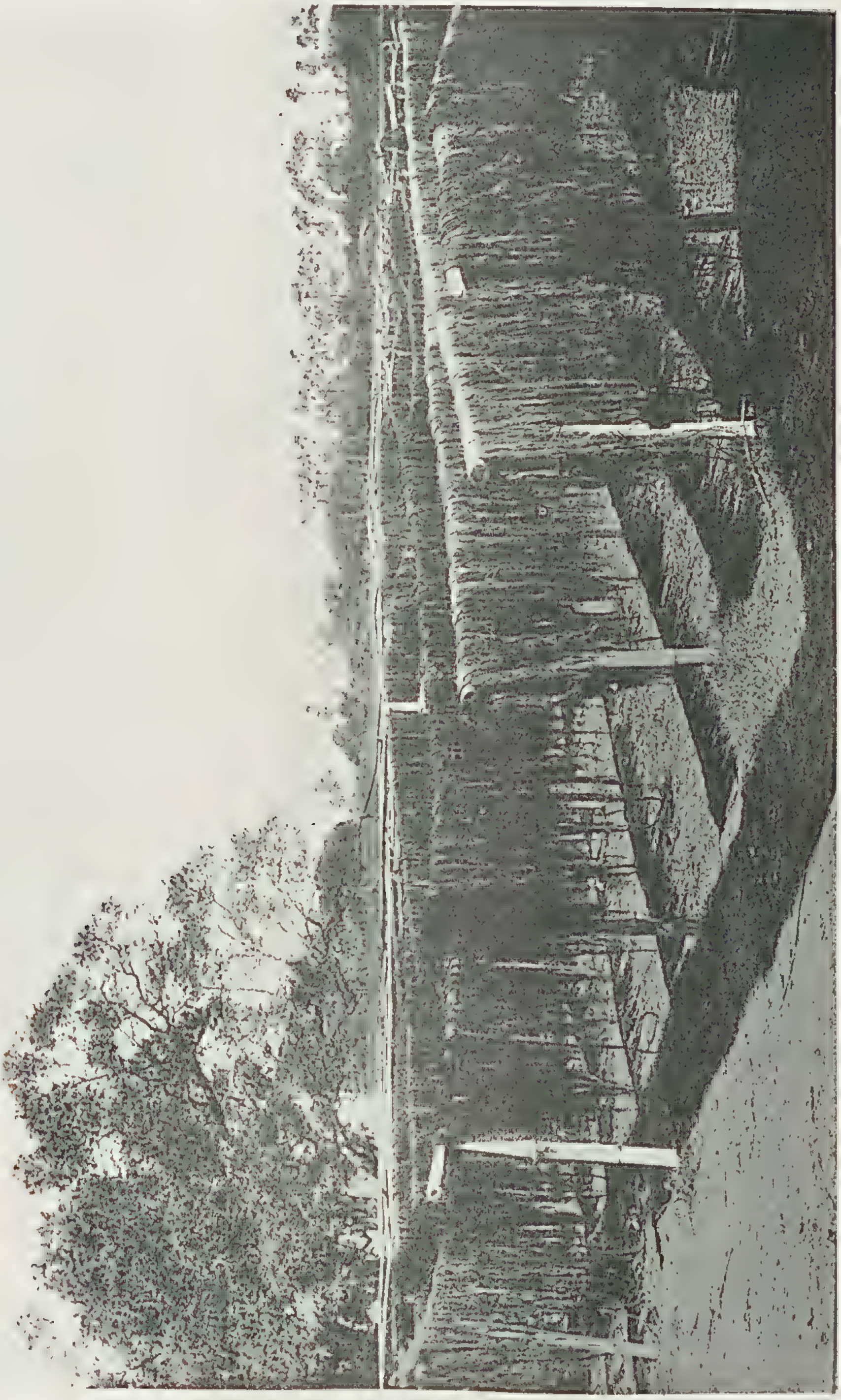
machines, provide and erect the buildings, bale, ship, and sell the fibre, while the planter undertakes to grow and manufacture the fibre at his factory, the expenses and realisations in connection with the whole enterprise being brought under a joint account. The area covered by these contracts aggregated over 3,000 acres. As the planting and cultivation progressed, it was found that many of the localities which had been selected were unsuited to the growth of rhea, so that ultimately the area actually put down did not exceed 2,000 acres. This quantity has again been reduced considerably, owing to damage caused by quite recent floods. At Dalsing Sarai greater headway has been made than at other places, and it will be sufficient for the purpose of this article if my remarks are confined to these experiments alone.

Manufacture.

As already stated, the decorticator selected is that known as the Faure machine (Plate II.). These machines are of two kinds—one, the ordinary machine used for scutching the butts of the stems; the other, similar to the first, but with the addition of a counter-action, to which the stems, after insertion into the machine, are attached by the scutched ends, and by which the fibre is automatically withdrawn and delivered. In practice it is found that one ordinary machine will scutch the butts of enough stems for two counter-action machines, so that it is found convenient to work the machines in triplets. The decorticators consist of a set of beaters revolving at a speed of about 500 to 600 revolutions, and operating on the stems against a counter-beater supported by suitable springs and india-rubber buffers, which cause a give-and-take to the action of the beaters as the stems are being drawn in and scutched. This enables the beaters to exert sufficient action on the stems to break the wood and scrape the cuticle without snapping the fibre. This has been the chief aim and object of the inventor, and is a great improvement on the rigid counter-plate of other machines, which causes such a loss in fibre by cutting. But it should be mentioned that the Faure machine, although the best of its kind in this respect in the market, still causes a very considerable loss by cutting. In order to obviate this defect, the inventor has quite recently introduced a new improved decorticator (Plate III.), which is still undergoing its trial at Dalsing Sarai. Instead of the fibre being drawn back in the process of scutching by the automatic counter-action, it is carried straight through a set of beaters, which merely break and disintegrate the wood and bark, and is then deposited on to a carrying chain, when it is presently caught at one of the ends by a comb and fixed tight on to this chain. In its progress the opposite ends are quietly dropped between the blades of a couple of drums of quick revolving beaters, and on the return journey of the chain are withdrawn. The action of these beaters is so adjusted as to cause a combined hitting and scraping motion, and is yet so regulated that the tension exerted on the fibre is not enough to break it. In this way the inventor expects to save entirely the loss by cutting experienced with the old machine. The installation put up at Dalsing Sarai consists of three sets or triplets of the old machines, and two new and improved machines. The whole is worked from a counter-shaft driven by a 20-h.p. engine. Tanks at a high level for the supply of water under pressure to the machines for washing purposes have been erected, and two hydro-extractors for the preliminary drying of the fibre. A sirocco fan for finally drying the fibre in wet and cloudy weather, and a baling machine with suitable rooms for storage, have also been added. After the stems have been decorticated, the fibre is taken by coolies and washed in running water, or, if found more convenient, a jet of water is allowed to play on the beaters of the machine in the process of scutching. The action of the water is to remove a large proportion of the gum surrounding the individual fibres, which is at that time in a soluble state, and can be removed by water, but would harden and become insoluble if

allowed to dry. The fibre is then placed in the hydro-extractor for five minutes, and from there it is either hung out to dry in the sun (Plate IV.), or, if the weather is wet or cloudy, is dried by means of the sirocco fan. It is then conveyed to the store-room, where the pieces of wood which may still adhere to it are hand-picked, the fibre pressed into bales, in which condition it is despatched to market. The quality of the fibre thus produced is variable, and cannot be said to be equal to China grass. The latter is very carefully decorticated by hand, the outer cuticle and the wood entirely removed, and the parallelism of the fibres kept intact. In other words, hand-decortication as practised by the Chinese is well night perfect, and no machine has yet been able completely to emulate it. On the other hand, a percentage of wood and bark is always to be found in machine-decorticated rhea, and the parallelism of the fibres is impaired. In spite of this, however, spinners have expressed themselves satisfied with the quality of the produce as prepared by the Faure machine, and are prepared to take it over in any quantities. The defects referred to are easily removed in the subsequent processes of degumming, cleaning, and combing, but must of necessity add to the cost. It is outside the scope of this article to discuss at length the details of those operations, and it will be sufficient to say that the spinner first sorts the produce into two or three lengths, after which it is transferred to the degumming bath, where it is submitted to a combined treatment of steam and chemicals, with the object of entirely removing the gum. This operation is of an extremely delicate nature, for the chemicals used to dissolve the gum would, if allowed to do so, also attack the fibre. Many processes have been invented for this purpose, some of which are patents, but others again have been kept strictly secret. Spinners at present prefer to degum, not entirely because there is an element of profit in the process, but chiefly because it is such an important part of the preparation of the fibre, and the probabilities of injury are so great that they cannot take the risks of badly degummed or injured fibre. For these reasons it is not at present possible, as many suppose, for the manufacturer of the raw product to degum at the factory, for he would run the risk of the whole of his produce being rejected for improper treatment. And even if we were able to degum satisfactorily, it would not be advisable for him to attempt it in the present condition of the trade. Rhea is in demand for a great variety of purposes, many of which do not require degummed fibre. He would, therefore, be narrowing his market if he produced degummed rhea alone. After the degumming process is completed, the fibre has to be thoroughly washed until all trace of the chemicals is removed. It is then combed and made into "sliver." It is in this process that the want of parallelism in machine-decorticated rhea is felt. If the fibres are mixed, there is a greater likelihood of breaking in the combing, causing a large production of tow. Tow, however, is not waste, and, unlike most other fibres, owing to the very long staple which rhea possesses, it can be worked up again and spun into yarn. The subsequent operations for spinning rhea fibre require special machinery. The writer, in 1903, visited the spinning factory at Emmendingen, in Germany, which at this moment absorbs probably two-thirds of the total of the world's output of the raw product. The machinery used for spinning was the invention of the proprietor, Herr Baumgartner, and had been specially constructed for him in England, to meet the peculiar requirements of the fibre. The intelligence and resource with which this work is being carried on deserves the highest praise, for it is probably far ahead of any other similar undertaking. The samples of yarn and finished product which were exhibited show the numerous uses to which the fibre can be applied. Hosiery and underclothing, brocades, pongees, damask linens and lace, gas mantles, sewing and crochet threads, light and heavy plushes, knitted shawls, and even the latest fashionable straw hats for ladies, are a few of the materials into which it can be converted. The strength and yet lightness of the fibre, and the fineness to which it can be

Plate XVIII.



Decorticated Rhea Drying.

spun, together with the fastness and brightness with which colours cling to it, are not among the least important of its remarkable qualities.

Cultivation.

It is now necessary to say a few words about the cultivation of rhea. The plant belongs to the family of nettles (Urticæ), and to the subdivision Bœhmeria. There are many varieties, but two only are considered the best for fibre purposes—namely, *Bœhmeria nivea* and *Bœhmeria tenacissima.* The latter grows in tropical countries such as Java, Sumatra, Borneo, Malacca, and Mexico, but will not grow well in Behar, the climate being too dry. On the other hand, *B. nivea* flourishes in temperate and semi-tropical countries, and is the variety to cultivate in Behar. The difference between the two is easily distinguished by the white woolly appearance underneath the leaf of *B. nivea,* which is absent from *B. tenacissima.*

Rhea demands that the richest lands should be selected for its growth, and they should be free from any suspicion of flooding or water-logging. If it is planted in inferior lands, disappointment is sure to follow. The object in the cultivation of rhea is to obtain a quick and vigorous growth. The stems in well-established plants should be as tall as possible, from 4 to 6 feet, but never less than 3 feet. Four good cutings should be secured per annum if it is to pay, and the total weight of these four cuttings of green stems should not be less than 30,000 lb. per acre, or say, 15 tons. The yield of dry fibre from these stems should not be less than 2½ per cent., making 750 lb. per acre per annum. This amount will vary with the efficiency of the decorticating machine. The possible amount of fibre to be obtained from the stems is believed to be 5 per cent., but, owing to the large amount which is broken and cut away in the rough process of decortication, only 2½ per cent. can be relied on for an average yield with existing machinery, and this is given by the Faure machine.

The best and surest mode of propagation is from the root, though it can be grown, but with less certainty of success, from seed or cuttings. The bush intended to be used for propagation should be entirely dug out of the ground, and the stool of roots left exposed for some days under the shade of a tree. Leaf buds will soon be seen to shoot from the eyes in the roots, and it is then time to transplant. The stool should be cut into pieces of about 9 inches in length, with three or four buds to the piece. The land should first be thoroughly prepared and broken up to a depth of 9 to 12 inches if possible, and brought to a fine tilth. For this purpose an English or American plough is recommended. The sets should then be laid to a depth of 4 inches, 3 feet apart in a previously prepared furrow, the distance between the furrows being 4 feet. In weak lands closer planting is found advantageous. The furrows can then be covered over in the usual way. The best time of year for planting operations is July and August, when the rains have set in, as there is then less chance of failures in germination. After the sets have well sprouted, the land should be kept hoed and free from weeds, and an occasional ploughing given when necessary.

The rhea plant takes two years to establish itself, and no remunerative results should be expected until the second or third year, when the bushes have reached maturity. It is, however, advisable to cut down the bushes during the first two years of growth whenever they reach a height of 3 or 4 feet, as this will induce the roots to spread with greater rapidity. When the plant has reached maturity, it should be stripped of its leaves on the field while standing, and then the stems cut as close to the ground as possible, tied in sheaves of a foot diameter, and conveyed to the decorticators. The period of growth at which to cut the plant for the best possible results is when it has attained an average height of 5 or 6 feet and some 18 inches of the bottom

of the stem has turned brown in colour. The plant should never be allowed to become over-matured, for, after a certain age, the lateral buds on the stem begin to shoot and start a joint in the length of the main fibre, causing it to break during decortication. As soon as possible after the plant has been cut, and before the new shoots from the roots make their appearance, the land should be well ploughed between the rows. A double mould-board plough, with which the earth can be thrown up over the roots, is an advantage, though not a necessity. No ploughing should be done while the next growth of plant is taking place, as the operation would break the new shoots and interfere with a proper growth of stem, but, if necessary, a hoeing or weeding may be done. After a number of cuttings have been taken, an accumulation of woody matter will become apparent on the surface of the stool, being the stumps of the previous cuttings. If a careful observation is made, it will be noticed that many stems will be shooting from these stumps where they have kept green. The growth of these is always unsatisfactory, and seldom attains a greater height than 2½ feet. A vigorous growth of fresh suckers from the root should always be induced, and it is therefore necessary from time to time to slice away the upper surface of a stool immediately after a crop has been harvested, and thus remove the woody matter. This can be very cheaply and effectively done with a sharpened hoe (*kodali*).

MANURING.

I am of the opinion that liberal manuring is essential to the successful cultivation of rhea. The planter should aim at obtaining an average weight of 4 tons of stems per acre from one cutting, and as four cuttings per annum should be harvested, a crop of 16 tons per acre per annum represents the withdrawal from the soil of a very considerable amount of plant food. Taking this to represent 3 tons, or 6,000 lb., of dried stems, on the basis of analyses of the rhea plant made by Mr. Forbes Watson, the amounts of the following constituents taken from the soil in one year would be—potash, 1,938 lb.; soda, 978 lb.; phosphoric acid, 576 lb.

Without the use of manures such a drain would very quickly lead to exhaustion of the soil. At the same time, it is necessary to observe that fibre is a carbo-hydrate, the carbon being derived from the air, and the water alone from the soil, and the other mineral constituents are used in the construction of portions of the plant other than the fibre. It follows that if the refuse from decortication be returned to the land, there would theoretically be no withdrawal of plant food from the soil, and the only manuring required would be this return of the refuse to the land. In practice, however, there will be found to be a certain amount of wastage, and this would have to be made good by the addition of a limited quantity of manure to the refuse. It thus appears that once the enterprise is established, and the first quantities of refuse have thoroughly rotted, the supply of manures will not be a very expensive item. In laying out a plantation for the first time, the application of organic manure is highly recommended, as it gives the young crop a good spring, and enables it to quickly establish itself.

COST OF PRODUCTION.

I have already stated that 30,000 lb., or 15 tons, per acre of green stems should be obtained from four cuttings in one year, from which 750 lb. of dry fibre can be obtained, or, in other words, it will take 3 acres to make a ton of fibre. This yield has actually been obtained over a few acres, but, in order to maintain it, the very high state of cultivation I have recommended should be adopted. Whether it will be possible to secure this yield over the whole area of 500 acres under cultivation at Dalsing Sarai has yet to be ascertained. I am, therefore, unable at present to give definite information as to results

on such a large scale. But, assuming that the yield mentioned will be realised, the cost of production would be approximately as follows:—

Cost of producing 1 ton of rhea fibre per annum from 3 acres—

	Rs.
Cultivation, supervision, and general charges on 3 acres, at Rs. 20 ...	60
Manuring, at Rs. 15 per acre	45
4 cuttings on 3 acres, at Rs. 3	9
Carting 45 tons of green stems, at As. 6	17
Decorticating 45 tons of green stems, at As. 9	25
Washing and drying	10
Hand-cleaning	10
Baling and despatching	12
Engine, coal, &c.	30
Special establishment	20
Freight home and insurance	75
	Rs. 313
Price of 1 ton of fibre, at £30	„ 450
Balance of profit on 3 acres	„ 137 (or say £9)

[1 rupee = about 1s. 4d.—ED. "Q.A.J."]

This will, therefore, give a profit of £3, or Rs. 45 per acre. Undoubtedly, there is still much room for improvement in the Faure machine, but this is only a matter of time. The real difficulty about rhea is its agricultural aspect. Is it possible to obtain 1 ton of dry fibre per annum from 3 acres? This is the vital question at the present price and with the present machine, for, after all, the ultimate test as to whether it pays to grow depends upon the profit *per acre.* The more acres it takes to produce a ton of fibre the less must the profit be, and inversely the heavier the crop which can be grown the larger the profits. Now, the agricultural requirements of rhea do not seem to have been thoroughly appreciated. It is not a plant that will grow anywhere. It requires well-drained land, and that of the best quality. It must be well cultivated, and until the refuse from decortication has accumulated in sufficient quantities in a well-rotted condition, other manures must be applied to it, and, if necessary, purchased. Too dry a climate will not suit it, for to obtain four full cuttings in one year postulates a considerable amount of humidity. After a time the roots will have covered the field, and an accumulation of wood will have taken place from repeated cuttings. It will then be necessary to prune the surface of the stool to induce shooting from the root. Should this eventually prove unsuccessful, and the plant refuse to grow at a greater height than 3 to 4 feet, it should be dug out and a fresh plantation started in another spot. It is a mistake to suppose that rhea will grow on the same land indefinitely. Rotation is as necessary for this crop as for any other, the time for the change being determined as I have indicated.

These conclusions are based on the price at present ruling in the market for decorticated rhea, and on the present efficiency of the machine. If either of these two were to improve, naturally the agricultural question would be eased. In other words, if the machine could be made so as to yield 3 to 4 per cent. fibre instead of $2\frac{1}{2}$ per cent., or if the price of fibre rose to, say, £40 per ton, the profit per acre would be considerably improved, and the necessity for exacting such a high yield from the land would not be so apparent. But there is seldom any use in growing a crop which cannot and is not grown at its best, and I would still maintain that if it is found impossible to grow a crop of, say, 15 to 20 tons of 4 to 5 feet stems per acre per annum, the enterprise should be abandoned.

PRICE.

A few words may be added about the market price of rhea. It sells at the present day in Europe at from £25 to £38 per ton. This price is regulated by the supply from China, which is the over-production of an indigenous industry; the demand is from a small handful of European spinners, who appear entirely to control the trade. The total consumption of the fibre in Europe is probably not more than 3,000 tons. If a true demand arose among consumers, the amount required would be something enormous. When we consider that rhea is both a textile and a cordage fibre, and that its intrinsic merits are acknowledged by all authorities to excel those of any other known fibre, the lowness of its price is a matter for some astonishment. Cordage fibres, like manila and aloe, will fetch any price from £30 to £50 per ton; flax from £40 to £100; jute, which intrinsically is vastly inferior to any of the fibres named, is now fetching £22 per ton. How is it that the finest fibre in the world can with difficulty realise £26 to £38? The answer is not far to seek. A market for rhea in the true sense of the term does not at this moment exist. The supply is so small that it cannot make its influence felt; but, if supplies increased to 100,000 tons, the result would be different, and I have little doubt it would be taken up with avidity. The prices would in all probability rise higher than those of flax, and we should soon see a most valuable industry placed on a firm and lasting footing. The prices which spinners are now offering for the raw product are quite out of proportion to its intrinsic merits, and the consequence is that there is no inducement for cultivators to extend their operations. The quality of the land, and the high class of agriculture required for the growth of rhea, call for a greater value for the raw product. Even if the figures given in this article could be depended on for a cultivation on a large scale, and considering the very high quality of land which it is necessary to select, there are other crops that pay better than rhea. If spinners are truly desirous of developing this important industry, they must encourage the grower, and offer a price more commensurate with the intrinsic value of the product.

JUTE-GROWING IN INDIA.

In his annual report on the Bengal Agricultural Stations, the Deputy Director of Agriculture gives some very interesting matter. Speaking of the jute crop in Bengal, he says:—"The cry of agricultural depression, which has been more or less the wail in Europe since the 18th century, cannot be stated to hold good for Lower Bengal at present; in fact, the cultivator of this area is very much to be envied by many of his fellow workers in other parts of the world. In jute he has a very profitable crop. Twenty maunds of fibre per acre can be easily obtained with very little money expenditure on his part. Enough good seed for 1 acre can be purchased for 1 rupee. The rest of the work can be done by himself and family. Taking a moderate price of 10 rupees per maund, a return of 200 rupees will be obtained in five months for his small initial expenditure. If the cultivator is afraid of the green caterpillar, let him apply 2 maunds of saltpetre per acre, two or three weeks after sowing his seed, and run the "*bida*" over the land. The resulting plants will be stronger and less liable to attack, and should the caterpillar make its appearance, the extra foliage produced will allow of plenty of damage being done without lowering the yield very much. As the present supply is not equal to the demands of the trade, high prices for the crop are very probable for some time to come."

This Department is specially interested in these facts, as it is conducting experiments with this crop at two of its experimental stations—namely, Raipur and Nagpur.

In the report just published the Director states that the conditions favourable for jute cultivation are—(*a*) a high temperature; (*b*) a deep soil of fairly fine texture; (*c*) a rainfall of over 40 inches, distributed over the period of growth of the crop, so that while the young plants have plenty of moisture to ensure vigorous growth, the bulk of the fall takes place when the crop is more mature—a regulated supply of irrigation water may act as substitute for this; (*d*) a sufficient supply of clear water for "retting" the crop after it is cut.—"Agricultural Gazette," Nagpur.

PROPAGATION OF THE DATE PALM.

The date palm being familiar to every resident of Cyprus, the following extract from a paper by Mr. F. Fletcher, M.A., B.Sc., which appeared in the "Agricultural Ledger" (1906, No. 1), will be of interest:—

The date palm may be propagated in two ways—viz., (*a*) by means of seed, and (*b*) by means of off-shoots.

Of these methods the latter is the only rational one, for the reasons that, if seeds are sown, about half the seedlings are males, and, of course, yield no fruit, while female seedlings seldom produce fruit of as good quality as the tree from which the seeds were obtained.

Now, one male tree will, under cultivation, suffice for the fertilisation of about 100 females, so that if 98 per cent. of the male seedlings are not destroyed, about half the area of the plantation is occupied by useless trees. This removal of the superfluous males cannot take place until about six years, at the earliest, after sowing, since at that age flowers are first produced. In consequence, for six years at least half the plantation consists of trees from which no revenue can ever be obtained.

The reason why seedling female palms do not produce fruit of the same quality as their female parent is that the latter is in general pollinated (artificially) from a male of an inferior variety, and although, except in the case of maize and a few other plants, cross-fertilisation of this kind has no effect on the quality of the resulting fruit, it will, of course, influence the offspring. Probably, therefore, out of 100 seedlings from a good female parent only about six would produce fruit of good quality.

PROPAGATION BY MEANS OF OFFSHOOTS.

This, as was stated above, is the only rational method of propagation, since it is thus only that palms, true both in sex and in quality of fruit to the type of the parent, can be secured. We can by this method plant 100 female trees, on the quality of the fruit of which we can rely, and the one male necessary to fertilise these, without wasting time and land in cultivating superfluous male trees and female trees which later prove to bear fruit of an inferior quality.

The offshoots are suckers borne at the base of the stem of trees between the limiting ages of about six and sixteen years. Trees younger than six years of age and older than sixteen do not, as a rule, bear offshoots. Offshoots cut from a male tree will give rise to male trees, and from female trees, females; in the latter case the fruit will be of the same quality as that of the parent palm.

Offshoots are removed from their parent when from three to six years of age. They then weigh about 6 lb. The operation of removal is performed with an ordinary hatchet by cutting down parallel to the parent stem. The large leaves are then cut away, as in the case of seedlings, leaving only the rootless stump of the offshoot, with its bud protected by leaf-stalks and young leaves.

The offshoots should be planted in rows 25 feet apart, with similar intervals between plants in the row. For this purpose holes 3 feet deep and

the same distance in diameter are made in the soil; half of the excavated earth is mixed with its own volume of farmyard manure, with 4 lb. or 5 lb. of oil cake, and filled in, the offshoot being set in the centre of this hole.

In doing this, it is most important that the bud in the centre of the leaf-stalks and young leaves should not be choked by being covered with soil. For this reason the offshoot should be planted with the bud 2 or 3 inches above the general level of the ground, and a circular trench, 1 foot in width, be dug round it for purposes of irrigation.

The offshoots should be watered every day for the first month, twice a week for the second month, and thenceforward every month for at least a year.

During the first year after planting out, the offshoots should be protected from November to March by wraping them closely in straw or matting.—"Cyprus Journal."

PIPE TOBACCO IN AUSTRALIA.

By R. S. NEVILL.

There was imported into Australasia from the United States of America in the year ending 31st December, 1906, 6,939,014 lb. of tobacco, against 5,492,718 lb. for the year ending 31st December, 1905—an increase of 1,446,296 lb., or a fraction over 26 per cent. in one year.

This does not represent our entire imports of American tobacco, as there was probably a considerable amount brought here that was purchased in the English markets. The bulk of this tobacco was for pipe-smoking, and probably 75 per cent. of bright and semi-bright varieties.

It seems but reasonable that our farmers should make an effort to secure a large part of this trade, and they certainly should be able to do so if they will make an intelligent effort, and I am sure they will receive every encouragement from the local manufacturers.

While the consumption of the heavier types of tobacco is large, yet it is decreasing, and the consumption of the lighter sorts is correspondingly increasing, and especially is the cigarette increasing in favour; these take the very lightest and mildest types.

While the prices for the lighter sorts are much higher than for the heavy darks, yet the heavy yield of the latter pretty nearly equalises the returns to the grower, but there is always greater danger of there being an over-supply of them. The Australian farmer should endeavour to supply the trade with both the bright and heavy sorts, reduce these large imports, and keep the large sum of money at home that is annually sent abroad to pay for this tobacco.

The growing of these bright tobaccos can only be done on the light sandy soils, and by securing seed of varieties that are known to cure bright readily, such as Hester, Ragland's Improved Yellow Pryor, White Stem Orinoco, Yellow Pryor, and Lax. All of these tobaccos will cure bright if grown on proper soils, cut at the proper time, and properly treated. When the weather is favourable, to sun-cure—that is, to cure on scaffold—is an excellent method, is simple, and, I believe, will largely eliminate the objectionable qualities of our tobaccos, and give them a flavour that will commend itself to the consumer.

In this method, when the sun is hot, a width of cheese or butter cloth should be drawn around the scaffold to prevent burning. When the weather is showery or unsettled, then the flue-curing, or charcoal in tight sheds, is the only sure method of getting a large percentage of bright tobacco. The flue-cure is the successor of the old-fashioned charcoal process, and is decidedly the best and surest. In either of these processes the main idea is, first, to yellow the tobacco, and the heat in the room should be kept at 93 to 95 degrees, day and night, until the tobacco is yellow, and then gradually raised very slowly, say 5 degrees an hour, until 140 to 150 degrees are reached, and there remain until the tobacco is dry. Care should be taken that the tobacco does not sweat in

the early stages of curing. Hang a pane of glass in the drying-room; and should it begin to get moist or wet, it shows the air is too moist and will not longer absorb moisture—it is then when the tobacco will sweat and sponge. Under these conditions open all the vents in the room for a few minutes to allow this excess of moisture to escape.

Bright tobaccos should be bulked as soon as cured by this process; if allowed to hang, the colours will run, and spoil.

When bright or light colours are desired, tobacco should not be allowed to get over-ripe, but should be cut when the plant is fairly well turned into ripening; and just before fully ripe. It is very difficult to get bright colours if the crop is a late one, as the cold dewy nights thicken the leaf, which is unfavourable to bright cures; hence the crop in Australia, if possible, should be transplanted in time to be harvested not later than the middle of April, earlier if possible.

Times of Sunrise and Sunset, 1907.

DATE.	MAY.		JUNE.		JULY.		AUGUST.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·13	5·17	6·30	5·1	6·39	5·3	6·30	5·18
2	6·14	5·16	6·31	5·0	6·39	5·4	6·30	5·19
3	6·14	5·15	6·31	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·29	5·20
5	6·15	5·14	6·32	5·0	6·39	5·5	6·28	5·20
6	6·16	5·13	6·32	5·0	6·39	5·5	6·27	5·21
7	6·16	5·12	6·33	5·0	6·39	5·6	6·27	5·21
8	6·17	5·12	6·33	5·0	6·39	5·6	6·26	5·22
9	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
10	6·18	5·10	6·34	5·0	6·39	5·7	6·24	5·23
11	6·18	5·10	6·34	5·0	6·39	5·7	6·24	5·23
12	6·19	5·9	6·35	5·0	6·39	5·8	6·23	5·24
13	6·20	5·8	6·35	5·0	6·38	5·8	6·22	5·24
14	6·20	5·8	6·36	4·59	6·38	5·9	6·21	5·25
15	6·21	5·7	6·36	4·59	6·38	5·9	6·20	5·25
16	6·21	5·7	6·36	5·0	6·38	5·10	6·19	5·26
17	6·22	5·6	6·37	5·0	6·37	5·10	6·18	5·26
18	6·23	5·6	6·37	5·0	6·37	5·11	6·18	5·27
19	6·23	5·5	6·37	5·0	6·37	5·12	6·17	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·16	5·28
21	6·24	5·4	6·38	5·0	6·36	5·13	6·15	5·28
22	6·25	5·4	6·38	5·1	6·35	5·13	6·14	5·29
23	6·25	5·3	6·38	5·1	6·35	5·14	6·13	5·29
24	6·26	5·3	6·38	5·1	6·35	5·14	6·12	5·30
25	6·26	5·2	6·39	5·1	6·34	5·15	6·11	5·30
26	6·27	5·2	6·39	5·2	6·33	5·15	6·10	5·31
27	6·27	5·2	6·39	5·2	6·33	5·16	6·9	5·31
28	6·28	5·2	6·39	5·2	6·32	5·16	6·8	5·32
29	6·28	5·1	6·39	5·3	6·32	5·17	6·7	5·32
30	6·29	5·1	6·39	5·3	6·31	5·17	6·6	5·32
31	6·30	5·1	...	...	6·31	5·18	6·5	5·33

PHASES OF THE MOON.

		H. M.
5 May	☽ Last Quarter	7 53 a.m.
12 „	● New Moon	6 59 p.m.
20 „	☾ First Quarter	11 27 „
28 „	○ Full Moon	0 18 a.m.
3 June	☽ Last Quarter	3 20 p.m.
11 „	● New Moon	9 50 a.m.
19 „	☾ First Quarter	0 55 p.m.
26 „	○ Full Moon	7 27 a.m.
3 July	☽ Last Quarter	0 34 a.m.
11 „	● New Moon	1 17 „
18 „	☾ First Quarter	11 12 p.m.
25 „	○ Full Moon	2 29 „
1 Aug.	☽ Last Quarter	0 25 p.m.
9 „	● New Moon	4 36 „
17 „	☾ First Quarter	7 5 a.m.
23 „	○ Full Moon	10 15 p.m.
31 „	☽ Last Quarter	3 28 a.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1907.	ROCKHAMPTON.		TOWNSVILLE.		COOKTOWN.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
May	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June	1 m.	19 m.	10 m.	44 m.	7 m.	55 m.
July	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.
August	5 m.	15 m.	18 m.	36 m.	16 m.	46 m.

Animal Pathology.

WORMS IN SHEEP.

By A. H. CORY, M.R.C.V.S.L.

Both tapeworms and round worms are very common in sheep, particularly in wet seasons.

Treatment is preventive and curative, the former course being preferable; but, owing to the large areas of land on which sheep are pastured, it is practically impossible to thoroughly treat the surface of infested areas, so as to destroy the eggs or larvæ. When land can be treated, it is recommended that wet parts be drained, and that lime or salt be freely spread over the surface of the ground.

The treatment of sheep consists in giving good nutritious food, and a liberal supply of salt and iron, in the form of a lick or mixed in some food, allowing about 2 to 4 drachms of salt and 15 to 30 grains of sulphate of iron for each adult sheep; for lambs the smaller doses should be given.

Various forms of medicine are given internally, arsenic being one of the most popular; but this drug must be used with discretion, and, when given, I would strongly recommend the liquid form—viz., *Liquor arsenicalis*—the dose for sheep being from ½ to 3 drachms, according to age and size of animals. This preparation can be obtained from any chemist. Arsenic in the above doses (¼ to 1½ grains) does not injure the general health of the sheep. Oil of turpentine, in 2 to 4 drachm doses, given in milk or gruel, is also very beneficial in destroying worms. Naturally, these medicines should be given on an empty stomach, and the sheep should not be allowed food or water for an hour or two after being drenched.

BOVINE CONSUMPTION LEADS TO HUMAN CONSUMPTION.

ROYAL COMMISSION'S IMPORTANT REPORT.

A most important report, that will require to be more minutely examined at leisure, has been issued by the Royal Commission on tuberculosis. An interim report was some time ago issued, and now the Commission feels itself justified in boldly declaring that human beings may contract consumption from cows' milk infected with tubercular germs.

This conclusion directly contradicts the theory of Dr. Koch, who recently startled the scientific world by the statement that bovine and human tuberculosis was not inter-communicable—in other words, that human beings could not contract consumption from eating meat or drinking milk.

The main conclusions at which the Commission arrived at are these:—

"There can be no doubt but that in a certain number of cases the tuberculosis occurring in the human subject, especially in children, is the direct result of the introduction into the human body of the bacillus of bovine tuberculosis; and there can also be no doubt that in the majority of these cases the bacillus is introduced through cows' milk. Cows' milk containing bovine tubercle bacilli is clearly a cause of tuberculosis, and of fatal tuberculosis, in man.

"The facts indicate that a very large proportion of tuberculosis contracted by injection is due to tubercle bacilli of bovine source. A very considerable amount of disease and loss of life, especially among the young, must be attributed to the consumption of cows' milk containing tubercle bacilli.

"Our results point clearly to the necessity of measures more stringent than those at present enforced being taken to prevent the sale or the consumption of such milk."

Not the least interesting portion of the report is a brief critical and historical sketch of the whole question of consumption research. Here

unstinting tribute is paid to Dr. Koch for his remarkable discovery of the *Bacillus tuberculosis.* At the same time, what are now considered the mistakes of that scientist are duly recorded.—"Farm and Stockbreeder."

On this point, "The Mark Lane Express" says:—In several papers recently we have read of herdsmen having attained a great age in the following of their daily occupation. The writer himself knows of at least two such who were over ninety years of age, and whose entire lives had practically been spent amongst cattle. It is also known that subjects whose health has given signs of consumption or have been out of health in other ways have become quite robust by having made their home at a farm for a few months, and spending a good deal of their time in the byres and folds, and at the same time drinking the milk that the cows produced. Knowing this to be the case, it would appear that a great deal of the cry raised against our milk-sellers in respect of keeping their sheds and animals cleanly is quite uncalled for.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.										1907.		
	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
North.													
Bowen	6·29	0·78	6·34	0·69	0·04	0·36	3·41	1·76	0·99	11·01	2·53	3·74	1·97
Cairns	16·05	5·20	4·04	3·44	2·28	1·79	1·57	0·56	13·26	11·31	18·36	11·49	3·26
Geraldton	19·67	11·51	7·93	16·05	5·73	6·65	4·26	2·28	21·08	21·20	29·58	25·26	4·58
Herberton	4·67	1·25	1·38	1·04	0·59	0·55	0·38	0·30	5·16	10·82	10·56	11·77	2·05
Hughenden	8·47	0·12	Nil	Nil	Nil	Nil	0·92	0·61	0·51	4·76	1·98	3·83	1·17
Kamerunga	14·93	4·94	4·13	3·55	2·49	2·03	2·56	0·72	10·00	8·17	15·78	14·82	4·87
Longreach	12·25	Nil	0·22	Nil	0·11	Nil	4·11	2·16	0·66	0·51	1·22	0·49	1·88
Lucinda	25·88	10·12	3·77	3·02	0·40	...	Nil	1·85	6·60	*22·36	12·38	23·82	4·53
Mackay	16·57	2·87	11·87	3·85	0·68	0·93	4·35	2·63	1·80	12·93	2·72	6·42	*8·01
Rockhampton	8·26	Nil	5·27	1·12	Nil	2·61	3·80	1·07	0·46	5·19	4·15	4·42	3·05
Townsville	4·28	0·38	1·80	0·30	Nil	0·46	3·25	1·45	7·74	14·03	12·49	7·75	7·37
South.													
Barcaldine	13·84	Nil	1·70	0·19	0·10	Nil	2·88	2·92	1·33	1·04	3·44	0·43	1·51
Beenleigh	9·34	0·04	3·57	1·47	0·16	2·94	3·47	2·94	1·75	3·98	4·75	3·88	4·17
Biggenden	4·61	0·45	5·77	1·42	0·48	3·02	5·07	1·19	3·09	4·55	5·77	3·55	*10·59
Blackall	11·99	Nil	1·75	0·22	0·48	0·02	4·70	5·86	1·37	1·96	2·30	Nil	2·78
Brisbane	4·85	0·45	3·23	1·38	0·22	4·21	3·48	3·81	1·07	3·28	2·69	5·23	5·32
Bundaberg	1·90	1·17	8·44	2·01	0·03	1·86	10·90	1·57	0·97	3·85	3·29	3·90	12·81
Caboolture	6·46	0·49	4·53	0·85	0·29	3·02	4·77	4·73	4·26	3·15	2·53	8·03	*9·04
Charleville	3·15	0·07	0.85	0·13	2·34	0·35	4·99	2·66	1·30	3·71	0·85	Nil	2·75
Dalby	5·15	1·81	0·66	0·87	1·58	2·78	2·65	2·96	2·12	5·67	5·60	1·34	3·72
Emerald	5·22	0·08	2·12	0·17	Nil	1·62	4·47	1·55	2·32	1·79	7·36	3·67	7·66
Esk	9·04	1·74	3·25	0·77	0·38	4·51	4·14	2·90	2·45	5·26	2·87	6·79	3·60
Gatton Agric. College	9·43	1·40	1·90	0·60	0·41	3·73	3·54	2·25	2·01	3·45	2·62	6·44	2·71
Gayndah	5·86	0·51	5·10	0·48	0·22	2·34	5·14	2·25	4·25	2·82	3·00	1·91	6·89
Gindie State Farm ...	5·92	Nil	2·32	0·05	Nil	1·46	4·57	3·20	2·95	1·45	4·58	0·71	10·10
Goondiwindi	2·19	0·37	2·80	0·98	0·49	4·35	3·33	2·36	2·32	4·04	5·37	1·77	6·51
Gympie	5·58	0·45	6·88	2·26	0·52	3·19	3·97	3·03	4·12	5·32	3·99	6·96	8·93
Ipswich	3·87	0·12	1·67	0·25	0·17	2·59	2·94	2·60	0·71	4·22	2·17	5·38	1·95
Laidley	6·73	0·35	2·83	0·49	0·50	3·26	3·19	2·87	1·78	4·12	2·84	4·50	3·47
Maryborough	6·77	1·08	4·85	2·55	0·15	2·31	6·48	1·22	2·49	4·39	5·44	7·84	10·28
Nambour	9·35	1·13	6·20	3·68	0·61	4·52	8·94	4·89	3·40	6·74	5·74	12·05	13·30
Nerang	10·04	0 87	10·32	1·98	0·12	3·56	6·42	8·26	2·75	6·33	9·86	6·04	7·83
Roma	3·94	Nil	1·09	1·08	1·65	1·47	4·43	2·37	1·32	4·31	6·32	2·92	1·87
Stanthorpe	3·18	2·00	0·77	0·45	1·44	3·37	4·29	2·90	2·49	4·89	4·33	3·30	5·98
Tambo	10·63	Nil	0·66	0·05	0·67	0·07	5·17	2·85	1·23	1·16	4·74	1·81	3·58
Taroom	6·02	0·23	1·04	0·81	0·60	2·30	4·26	1·70	1·35	5·49	5·16	1·10	1·86
Tewantin	7·57	2·27	4·61	5·68	0·39	4·25	6·37	4·38	2·73	9·53	6·38	15·83	11·45
Texas	1·94	1·89	1·57	0·75	0·90	3·22	2·77	3·42	2·23	1·83	4·69	4·55	6·16
Toowoomba	8·87	2·07	2·65	0·85	1·81	3·63	4·55	2·76	2·65	4·11	3·94	4·00	4·81
Warwick	6·27	0·37	0·77	0·57	1·16	3·85	3·13	2·47	2·99	5·50	3·95	2·52	5·71
Westbrook	5·12	0·93	0·50	0·55	1·67	2·80	3·34	3·41	1·79	1·48	1·79	2·91	†

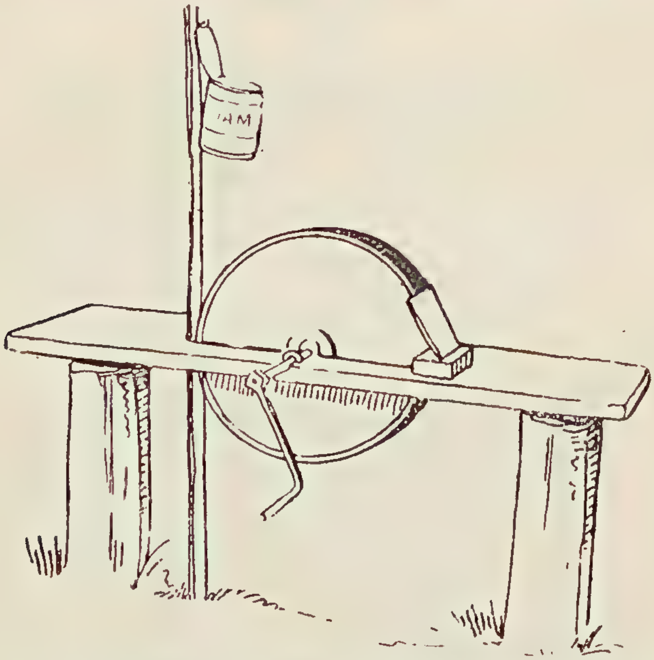
* Compiled from telegraphic reports. † Return not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

General Notes.

CARE OF A GRINDSTONE.

It is of no use getting a good grindstone unless you treat it properly, as it can be spoilt by ill-usage just the same as any other tool. In the first place, you must see that it is "true" (round) before starting to use it; you can tell this by laying a bar, just clear, across the frame, and turning slowly; if uneven, it will bump the bar at the full part. If not true, it must be made so, if only a little out by fixing a heavy piece of iron, or a bar, on the stand, so that the full ends will just grind on it; as they grind down to the true circle, keep shifting the iron up against them again till true. When right, the iron will be grinding all the time the stone is turning round. If very oblong, get a mason to cut it true, if not used to working stone yourself; if you are any good with the tools, mark the true circle from the centre with two nails in a piece of batten, or a nail and a pencil, on each side, and chip it out yourself. The stone true, see that the spindle runs exactly through the centre. This



fixed, set it into its stand, which may be carpenter-made as below, or as I prefer to use it, simply a broad slab squared and set firm and level on two stout blocks in a corner of the workshop. The centre of the slab is, of course, mortised out to let the stone drop in; each side supports its little wheel on which the spindle runs. The spindle is generally cast iron, and is good enough for ordinary use. The handle, however, should be wrought iron, as the cast one is too fond of breaking off short when you are in a hurry. Always have a flat block of wood on top of the slab at either end of the stone, just clearing it; this acts as a rest for the tool you are grinding, and makes it less liable to jump or chatter on the stone. This chattering is what makes the stone wear unevenly. Fix an upright as shown, with a screw in it on which to hang your tin of water. Anything tin does for a can, so long as it is watertight; punch a little hole in the side facing the stone, near the bottom, and plug it

loosely with a bit of rag or a dry stick; you will then, on filling the tin, have a constant trickle of water on the stone face whilst grinding. This is much better than the turner knocking off every now and then to wet the stone, and better for the steel, too. Never under any circumstances grind tools dry; it burns the carbon in the steel and ruins it. When turning, if you find the tool jumping off once for every time round, stop and turn very slowly till you find the little spot of iron or silica which is causing the jumping; chip it clean out with a nail, and resume grinding. Never leave the grindstone exposed to the weather, as heat and cold spoil the cementing material, and the stone is then ruined. The topside gets burnt with the sun, or over-wetted by rain and dew, and that top side then becomes softer than the bottom, causes the stone to wear out unevenly, and thus become oblong. If impossible for any reason to have the stone inside, always keep a couple of wheat or corn bags thrown over it, to modify the effects of the weather. If you find a stone is too hard, or becomes so after being used a little, soak it in the nearest waterhole for a few hours, or days, as it requires, and then keep it in a cool place afterwards. If a stone is too soft, put it in the sun for a few hours; this will sometimes bring them right, but, as a rule, soft stones are very hard to fix up satisfactorily. A grindstone for this reason should always stand in a shed, and for another, that wet days can be used up profitably grinding tools, thus saving time.

The whole art of grinding any tool consists of grinding it to the bevel which is necessary to its proper working. Every tool must be ground to its own shape; the art of getting this true bevel is to hold the edge of the tool just as far from the stone as you wish to grind the shoulder down. When the edge is just running on the stone, you know your bevel is ground up true. Thus you grind from the shoulder up to the edge, not, as many do, from the edge back to the shoulder; the latter way will always give you a bumpy, uneven bevel. Of course, the stone should always turn towards the tool. Grind always on the sides of the stone; when the centre gets too high you can grind there and level it down again; but always keep your centre a little higher than the sides.—"Agricultural Gazette of New South Wales."

TASTES OF MOSQUITOES.

The mosquito flourishes in certain parts of Mexico, just as he does in the United States and other parts of the world, but he is a nuisance, as a rule, only in the tropics. For our friends who live in places where he may be a source of annoyance, it will be a cause for rejoicing that scientists have discovered that, by choosing certain colours in dress, one may avoid, to a great extent, the infliction of these pests, which not only annoy, but inoculate with diseases.

Years ago it was found that a mosquito net of white was more effective than one of dark weave; and it has even been noted that the insects prefer to alight on black soil than on white sandy soil, and on black shoes than on tan or white ones. Obesrvations made in parts of the world as widely separated as Madagascar, India, and Italy, prove that light dogs are tormented less by the predatory insects than black ones, and that negroes suffer more from their bites than do Europeans.

Careful experiments with large numbers of the *Anopheles maculipennis* show their exact preferences for colour as follows:—Dark-blue is the favourite, with dark-red a close second; brown-red, black, greys, and violet-green follow in order, while azure, ochre, and white are decidedly distasteful, and yellow is abhorrent. A Swiss expert on malaria has just confirmed these conclusions, adding that of 152 mosquitoes experimented upon, nearly three-fourths settled by preference on dark colours.—"Mexican Investor."

FARMING IN THE OLDEN DAYS.

Some interesting particulars of the cost of living in the olden days are given in the "Scrap Book." If a man had a shilling in his pocket in the days of the Plantagenets, for instance, he could keep his family well supplied for a week. A sheep cost only a shilling. A cow was more expensive—6s. would buy the best to be found in the market. In the 14th century pasture and arable lands were ridiculously cheap—1d. an acre for the former, and 6d. an acre for the latter, being considered a fair annual rental. Draught horses were a drug on the market at 3s. each, and oxen at 4s. 6d. In the days of the second Henry £10 would have equipped a farm with three draught horses, half a dozen oxen, twenty cows, 200 sheep, leaving a balance of 8s. towards the payment of the rent. As for labour, 1½d. a day was deemed good wages for an ordinary labourer, and even at harvest time 2d. a day was the highest sum expected.

[It should be added that, in the Norman times, 1s. was as much in value as three of ours. Wheat was 6s. a quarter, or, according to our scale, 2s. 3d. per bushel. Two fat bullocks were worth 17s. 4d., or £2 12s. of our coin. Two hundred years after Domesday—*i.e.* in the reign of Edward I. (1299)—a ploughman's wages were 5s. a year—15s. by the present scale; a maid for making "pottage" received 1d. per week.—ED. "Q.A.J."]

MAIZE OIL.

It is not commonly known, perhaps, that oil is made from maize. According to the "Orange Judd Farmer," from 3,000,000 to 5,000,000 gallons of maize oil are made annually in the United States. The smaller quantity must be an under-estimate, as over 3,000,000 gallons were exported in 1903-4 and 1904-5, and 3,788,000 in 1902-3. This oil is used to some extent for culinary purposes, as well as for lubrication and in the mixing of paint.

"RATIN."

Every farmer has to count as a loss the waste caused in his stored grain by rats, apart from the fact that they are very repulsive about the house, and, when diseased, are carriers of plague. In Germany, the loss is estimated at £10,000,000 annually, and a loss similar in amount is said to take place in Great Britain every year. It will be a comfort, therefore, if what "Bruin" writes is true, that Professor Newman has found a destructive preparation called "Ratin," which has been subjected to a series of most severe tests, which it has withstood successfully. The German Minister of Agriculture has issued a circular, in which he says: "In order to test the efficacy and practical use of 'ratin,' the Chamber of Agriculture for the province of Saxony has made exhaustive trials in its own bacteriological institute, as well as on a number of farms. The results of these experiments have now come to hand, and show that 'ratin,' when applied in solid and liquid cultures, causes among the rats a deadly epidemic which kills off most of the animals—reaching often to 100 per cent. The cultures, which are readily eaten by the rats, are easily applied, and, in marked contrast to the usual ordinary poisons, are quite harmless to all domestic animals." What a delight it would be to farmers to be rid of these disagreeable rodents.—Exchange.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

CLEARING HEAVY TIMBER.

A. T., Lakura.—

For the method of clearing heavy timber by means of saltpetre and kerosene *see* Vol. IV., p. 341. Shortly stated, the process consists of boring a hole with an inch auger to a depth not beyond the solid wood. Fill the hole with saltpetre, and plug it up. In about three months the salt will have been absorbed. Then recharge with salt, and add kerosene. Plug up again, and, when the second charge has been absorbed, ring-bark the tree, and when the foliage has dried up, set fire to the tree, and it will burn completely out. The process is effective with large dry stumps. Of course, if time is a consideration, dynamite for stumps is more expeditious.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	APRIL. Prices.
Apples, Eating, per packer, Hobart	...
Apples, Cooking, per packer, Hobart	...
Apples, Eating, Local, per packer	3s. to 4s. 6d.
Apples, Cooking, Local, per packer	2s. to 4s.
Apricots, Local, per packer	...
Bananas, Local, per dozen	...
Bananas, Local, per bunch	...
Bananas, Fiji, per case	...
Custard Apples	2s. 6d. to 3s.
Cape Gooseberries, per quart	...
Grapes, per lb.	1d. to 1½d.
Lemons, Local, per packer	2s. 6d. to 3s.
Mandarins	...
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges, Local, per packer	2s. 6d. to 4s. 6d.
Papaw Apples, per case	5s.
Passion Fruit, per quarter-case	...
Peaches, per case	...
Peanuts, per lb.	2½d.
Pears, Imported, per case	5s. 6d. to 6s.
Persimmons, per case	...
Pineapples (rough leaf), per dozen	4d. to 2s. 4d.
Pineapples (smooth leaf), per dozen	1s. 6d. to 3s.
Plums, quarter-case	...
Quinces, per case	2s. to 3s.
Rockmelons, per dozen	...
Strawberries, per tray	...
Tomatoes, per quarter-case	6d. to 1s.
Watermelons, per dozen	...
SOUTHERN FRUIT MARKET.	
Apples, per case	...
" Tasmanian, per case	...
Apricots, per gin case	...
Bananas, Queensland, per case	5s. 6d. to 6s.
" " per bunch	1s. to 2s.
" Fiji, per case	11s. 6d. to 12s.
" " per bunch	3s. to 8s.
Chillies, per bushel	...
Grapes, per box	5s. 6d.
Lemons, Ordinary, per gin case	...
" Medium to good, per gin case	...
" Extra choice " "	...
Oranges, medium to extra choice, per case	...
Pears, per box	5s. 6d.
Persimmons, per half-case	1s. 6d. to 3s.
Pineapples, per case	5s. to 7s. 6d.
" choice, per case	...
" small "	...
Passion Fruit, per gin case	10s.
Strawberries, per dozen punnets	...
Tomatoes, Local, per half-case	2s. to 3s.
Watermelons, Queensland, per dozen	...
" medium	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL.

Article.		APRIL.
		Prices.
Bacon (Pineapple)	lb.	8d. to 9½d.
Barley (Malting)	...	...
Bran	ton	£3 15s.
Butter, Factory	lb.	9½d.
Chaff, Mixed	ton	£3 to £4.
Chaff, Oaten	,,	£3 17s. 6d. to £4.
Chaff, Lucerne	,,	£2 15s. to £3 17s. 6d.
Chaff, Wheaten	,,	£2 10s.
Cheese	lb.	5½d. to 6½d.
Flour	ton	£7 15s. to £8.
Hay, Oaten	,,	£4 15s. to £5.
Hay, Lucerne	,,	£1 15s. to £2 17s. 6d.
Honey	lb.	1¾d. to 2d.
Maize	bush.	2s. 3d. to 2s. 4d.
Oats	,,	2s. 11d. to 4s. 9d.
Pollard	ton	£4 to £4 5s.
Potatoes	,,	£2 10s. to £5 5s.
Potatoes (Sweet)	,,	...
Pumpkins	,,	...
Wheat, Milling	bush.	3s. to 3s. 2d.
Wheat, Chick	,,	2s. 3d. to 3s.
Onions	ton	£4 to £4 10s.
Hams	lb.	10d. to 10½d.
Eggs	doz.	10¼d. to 1s. 4d.
Fowls	pair	2s. 1d. to 2s. 9d.
Geese	,,	...
Ducks, English	,,	2s. 3d. to 2s. 6d.
Ducks, Muscovy	,,	2s. 5d. to 3s. 2d.
Turkeys, Hens	,,	4s. 9d. to 6s.
Turkeys, Gobblers	,,	8s. 9d. to 10s.

ENOGGERA SALEYARDS.

Animal.	MARCH.
	Prices.
Bullocks	£9 10s. to £11 10s.
,, (Extra Prime)	£14 7s. 6d.
Cows	£7 17s. 6d. to £9 2s. 6d.
Merino Wethers	22s. 9d.
C.B. ,,	22s. 3d.
Merino Ewes	16s. 9d.
C.B. ,,	18s. 9d.
Lambs	16s. 6d.
Pigs	Nil

Farm and Garden Notes for June.

FARM.—Although frosts will, in all probability, have already occurred in some exposed parts of the South-western districts, yet winter does not practically begin until the 24th of the month. Insect life is now dormant, and weeds are no longer a serious trouble to the farmer. Hence, now is his time to sow lucerne. Sometimes a dropping season in May will start a growth of weeds, but this should not act as a deterrent, as the lucerne will in all likelihood overcome the now slow-growing weed crop. Rye, prairie, and other grasses may also now be sown. Oats, barley, vetches, clover, tobacco, buckwheat, and field carrots and swedes may now be sown. Those who propose to sow millets, sorghum, panicum, &c., should begin to get the land ready for these crops. Some advocate the sowing of early maize and potatoes towards the end of the month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern district and on the tableland neither maize nor potatoes should be got in before the end of July or in August. There is always a probability of frosts during these months. Arrowroot will be nearly ready for digging, but the bulbs should not be taken up until the first frosts have occurred. Dig sweet potatoes, yams, and ginger. Sweet potatoes may be kept, should there be a heavy crop, and consequently a glut in the market, by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the potatoes out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand. Then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them. Then put down another layer of tubers, and repeat the process till the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Wheat for late harvesting may still be sown. It is too late for a field crop of onions. In tropical Queensland, the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

KITCHEN GARDEN.—Asparagus and rhubarb may now be planted in well-prepared beds or rows. In planting rhubarb, it will probably be found more profitable to buy the crowns than to grow them from seed; and the same remark applies to asparagus.

Cabbage should be planted out as they become large enough, also cauliflower, lettuce, &c.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnips, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschallots, if ready, may be transplanted, also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost; for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses, and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open border if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondii*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 inches apart.

Orchard Notes for June.

BY ALBERT H. BENSON, M.R.A.C.

The marketing of citrus fruits is still one of the principal operations in many orchards throughout the State, and the remarks anent this matter that have appeared in these notes for the past two months should be borne in mind and acted upon, as, no matter what the quality of the fruit may be, it always sells best when well packed and attractively got up, as the better it looks the better it sells.

I cannot lay too great stress on the extreme importance of handling the fruit carefully and of sweating it prior to shipment. The common practice of pulling the fruit from the tree and packing and shipping it straight away is responsible for a very large proportion of the loss so commonly met with in marketing the fruit early in the season. The skin in the earlier stages of ripening is rigid and full of moisture, so that it is easily bruised, the cells of the skin being ruptured. Fungus growth of various kinds attack the injured skin, with the result that the fruit soon becomes completely rotten, and is covered with a mass of greenish or bluish mould. This loss can be reduced to

a minimum by cutting the fruit instead of pulling it, and by handling it like eggs instead of like road metal. In addition to the ordinary loss on the fruit by bad handling, a further loss takes place when it is found necessary to cyanide the fruit, as, for example, when it has to be shipped to the southern States, as the gas at once finds out every bruise, case-mark, or injury to the skin, such as plugging—viz., pulling the stem out—and turns the same black thereby greatly detracting from the value of the fruit.

In many parts of the State deciduous fruit trees should be pruned during the month, and I strongly advise fruit-growers to read my remarks on this subject which appeared in a previous issue of this "Journal," as thorough pruning is seldom carried out, many trees being allowed to grow of their own sweet will without let or hindrance. This neglect to properly prune fruit trees is conducive to the rapid spread of many insect and fungus diseases, as when trees are allowed to grow into a dense bush it is impossible to keep them clean by means of any of the ordinary methods adopted for the eradication of disease, such as spraying, &c.; and when they are allowed to straggle all over the place, the straggling limbs are very apt to become more or less diseased.

Old neglected trees of good varieties, and of which the roots are still healthy, should be cut hard back, and all dead, broken, or badly diseased branches should be cut off and a new head be allowed to form; but where such trees only produce inferior fruit that is of no commercial value, they should be either destroyed or, if wished, they may be grafted on next spring with good valuable varieties. Old neglected trees are the breeding-grounds of many diseases, and when they are of no value whatever they should be destroyed, as they are a menace and source of infection to the neighbourhood in which they are growing.

Do not be afraid to prune too heavily, as it is better to lose a crop and thereby get your tree or trees into a healthy state than to leave them in an unhealthy and unpruned condition and get a poor crop of inferior fruit. Prune hard, and gather up and burn all prunings; do not let them lie about, but burn them up, as by doing so any diseases that may be on the wood that has been pruned off will be destroyed. Where trees are hard cut back and only the main limbs are left, it is advisable to follow up the same pruning with a dressing that will destroy all insects or fungus pests still remaining on the tree, and for this purpose the best remedy is to paint the stems and branches with the following mixture, prepared thus:—Boil 2 lb. of sulphur and 1 lb. of quicklime in 2 gallons of water for about one hour, then add fine clay to the mixture till it is as thick as paint, and apply with a brush. Fine flour can be used in the place of the clay if desired, and will render the mixture more lasting.

Where San José, Greedy Mussel, or Parlataria Scales are present, this method of treatment is the most efficacious, and is even better than spraying with the sulphur, lime, and salt wash mentioned in my pamphlet on spraying. This mixture is also of value for painting the stems and main branches of citrus trees covered with mosses or lichens or attacked by White, Red Circular, Black Mussel, or other scale insects.

Where the ground is ready, plant deciduous trees this month; do not plant too deep, and cut back hard at planting. Clean up the orchard thoroughly, and plough and leave the ground rough as soon as the trees are pruned and the prunings are burnt. Gather up and destroy all fly-infested fruit of all kinds, as the more thoroughly the fly is kept down during the winter on the coast, the fewer flies there will be to deal with in spring. Where not already done, see that pineapples are protected from frost, and keep the ground between the plants well worked in order to retain moisture, as the winter months are usually dry and the plants are liable to injury through drought. The same remarks apply to bananas, and the unripe bunches of fruit should be protected from slight frosts or cold spells by any suitable available material.

Ticks and Tick Fever Conference.

Minutes of Proceedings at Conference on Ticks and Tick Fever, held in No. 3 Committee Room, Parliament House, Brisbane, on TUESDAY, 7TH MAY, 1907.

Mr. E. G. E. SCRIVEN, Under Secretary for Agriculture and Stock, presided.

The delegates appointed to the conference were:—

Bald Hills—Bald Hills Progress Association, W. J. Hawkins.
Beenleigh—Logan Farming and Industrial Association, R. Wilson.
Beenleigh—A. and P. Society of S. Queensland, W. F. Hammel.
Biggenden—Biggenden A. and P. Society, W. A. A. Bates.
Boonah—Fassifern and Dugandan A. and P. Association, J. Haygarth.
Brisbane—Queensland Dairy and Herd Book Society, Alfred Gorrie.
Brisbane—National A. and I. Association of Queensland, J. H. McConnel.
Booyal—Booyal Farmers' Progress Association, Chas. King.
Brooyar—Brooyar Farmers' Progress Association, Edward Pike.
Bundaberg—Bundaberg A. P. and I. Society, H. R. Lessig.
Bundaberg—Gooburrum A. P. and I. Society, W. J. Tutin.
Bundaberg—Woongarra Cane-growers' and Farmers' Association, T. W. Walker.
Brisbane—Brisbane Milk Suppliers' Association, Mr. Morris.
Burpengarry—Burpengarry Farmers' Association, F. W. Uhlmann.
Childers—Childers P. A. and I. Society, A. C. Walker.
Crow's Nest—Crow's Nest A. H. and I. Society, Thos. Hamlyn.
Esk—Esk P. A. and I. Association, Alex. Smith.
Flagstone Creek—Flagstone Creek Farmers' P. Association, Jas. Scanlan.
Forest Hill—Forest Hill A. and P. Association, J. C. Neilson.
Gayndah—Gayndah P. A. I. and H. Association, N. Wade-Brown.
Gin Gin—Currajong and Gin Gin A. and P. Society, S. N. Innes.
Gladstone—Port Curtis A. P. and M. Association, J. Henderson.
Grandchester, A. J. Cotton.
Harrisville—Harrisville Farmers' Progress Association, Eaton Winks.
Hopetoun—Hopetoun P. A. and P. Association, Jas. Horne.
Ipswich—Queensland P. and A. Society, H. Pommer.
Ipswich—Ipswich and West Moreton A. and H. Society, P. W. Cameron.
Kilkivan—Kilkivan Farmers' and Settlers' Association, F. S. Schollick.
Laidley—Lockyer A. and I. Society, A. Hunter.
Ma Ma Creek—Ma Ma Creek Farmers' Progress Association, John Rose.
Maryborough—Wide Bay and Burnett P. and A. Society, W. M. Charles and C. J. Booker.
Mount Alford—Coochin Farmers' Progress Association, J. T. W. McLaughlin.
Mount Cotton—Mount Cotton and Redland Bay F. and F. Association, H. Heinemann.
Nanango—Nanango A. P. and M. Society, John Wittmann.
Nerang—S. Queensland and Border A. and P. Association, R. Weedon.
North Pine—Moreton A. H. and I. Association, A. T. Petrie.
Oakey Creek, *viâ* Eumundi—Kenilworth Farmers' Association, W. Sutton.
Rosewood—Rosewood Farmers' Club, Alex. Grant and J. L. Frederich.
Teutoberg, *viâ* Landsborough—Teutoberg Farmers' Progress Association, C. M. Nothling.
Wellington Point—Wellington Point A. H. and I. Association, H. J. Eichenloff.
Woombye—Maroochy P. A. H. and I. Society, D. Beattie.
Yandina—Yandina-Maroochy Progress Association, S. Kelly.

OPENING ADDRESS.

The CHAIRMAN said: On behalf of the Minister, I wish to welcome you to this Conference, and to express his regret that present happenings prevent him from being present. He would have liked to have been here, as he takes a great interest in the matters which will form the subject of your deliberations, but other duties have called him elsewhere. I do not intend to make a speech, and it is not my province to do so. I would sooner hear what you have to say on the matters which are set down for discussion, but with your permission will briefly recapitulate the history of the tick question up to the present time, so far as the Department is concerned. The ticks came to Queensland in the year 1894, first striking the country on the north-western boundary, and you will probably remember the consternation which their appearance caused among our Northern stock-owners, and during their progress southwards in what may be roughly described as a semicircle, for they travelled through the tropics on to the coast, and then down the coast. When we first tackled the pest we knew little about it. All we knew was what we had learned through the experience of America, and from reading up the subject generally. Oil dips were commenced, and the cost of dipping with the oil which was then used as an insecticide was 1s. 6d. per gallon, which made the cost of dipping a beast about 9d. per head. Now the dipping fluid costs about ¼d. per head, so that in that respect the Department has done something by means of the investigations and continual experiments made by our scientists and veterinary officers, and by the help of other practical men to find out the best dip to be used. And this, I think, has been accomplished in what is known as the Departmental dip of the following constituents:—Arsenic, 8 lb.; caustic soda, 4 lb.; Stockholm tar, 1 gallon; tallow, 8 lb.; water, 400 gallons. To further enlarge our knowledge on the matter, Mr. William Collins and Dr. Hunt were sent to America. We had to fight our own way, with the help of Mr. Pound and many willing helpers, and to find out things for ourselves. We first of all spent money in erecting dips and subsidising local authorities and other bodies in that direction. Something over £3,000 was spent in this way, but when a knowledge of dips had been spread abroad, the Department, instead of erecting dips, subsidised them, and left stock-owners to look after themselves in regard to that matter. Then inoculation came in, and inoculators were appointed to teach the people the proper method of inoculation, and who, after spreading the knowledge, were withdrawn for other duties. The Stock Institute was started, the sole object of which was to investigate diseases in stock. This was of great assistance, but after some little time the authorities decided to turn the Stock Institute into the Bacteriological Institute, and it then ceased to be under the control of this Department. When speaking of dips, I should have told you that there are now about 900 private dips in Queensland, nearly all of which the stock-owners allow to be used by the public. The Department has also spread abroad publications gathering into as small a space as possible the whole of the knowledge on this subject, so far as knowledge on the matter is available, and as showing you what the Department have done in this respect, I may enumerate the titles of the principal pamphlets and reports which have been issued. They are the "History and Prevention of Tick Fever," by Dr. Hunt; "Experiments by Dr. Hunt in Inoculation"; "Technique of Methods of Preventive Inoculation" (issued in the early days, and revised in 1904), by Mr. C. J. Pound; "Notes on Cattle Tick," by Fuller; "Translation of Experiments by Dr. Lignières," by Mr. Boyd; "Results of Dipping Tests," by P. R. Gordon (to whom we are indebted for the great interest he showed in this matter in the early stages of its development); "Remedies for Tick Fever," by Mr. Cory; "Life History of Cattle Tick," by Mr. Tryon; and "Report on Visit to America," by Dr. Hunt

and Mr. W. Collins. All these papers are at the service of anybody who wants them, and they have been distributed throughout the country. Another matter to which the Department have paid attention is the analysing of dips, and the work done in this connection has been of great service to the owners of stock. We found that the material which was being used in the dips was too strong in some cases and too weak in others, and since the Departmen have undertaken the work of analysing dips there has been a great improvement, both in the quality of the dips and in the effects of dipping. These are the main things which the Department have done throughout the years which have elapsed since the appearance of the tick in Queensland, and though it does not take long to enumerate them, yet they represent many years' hard work. Now we shall proceed to deal with the business on the paper. You will notice by the programme which has been issued, that the subjects for discussion have been classified according to their nature and character. I think it will be to the advantage of the Conference if the papers are first of all read, then take the discussion on the papers, and when that discussion is finished, deal with the subjects suggested by various institutions. My reason for making this suggestion is, that it is quite possible that some of the subjects set down on the paper may be dealt with by the writers of papers, and in that case, by following the course I have suggested, we shall avoid two discussions of the same matter. If it is agreeable to the delegates I shall put the business before the Conference in that way. Is there any objection to this mode of procedure?

ORDER OF BUSINESS.

Mr. NUGENT WADE-BROWN moved that the suggestion of the Chairman as to the order of business be adopted.

Mr. ALEX. GRANT seconded the motion.

Agreed to.

Mr. C. J. POUND (Government Bacteriologist) read the following paper:—

SOME INVESTIGATIONS INTO TICK FEVER AND MEANS FOR ITS PREVENTION.

DISCOVERY OF TICK FEVER (REDWATER) IN QUEENSLAND.

It is now nearly thirteen years ago since I was commissioned by the Government to visit the Gulf district, and report on the so-called "redwater" disease which was then just commencing to devastate some of the station herds and the travelling mobs of cattle on that part of the coastal country lying between Normanton, Burketown, and the Northern Territory. The conclusions arrived at were that this was a blood disease, intimately associated and spread by the agency of ticks; moreover, from the symptoms and characteristic *post-mortem* appearances, it was analogous to the redwater disease in Cape Colony, South Africa, and Texas fever in the southern parts of the United States of America.

FIRST RECORDED ACCOUNT OF THE DISEASE IN AUSTRALIA.

As a result of my inquiries I found that this disease first made its appearance in Australia on the Roper River, in the Northern Territory, in a mob of cattle belonging to Dr. Brown, travelling from Queensland to Newcastle Waters, about the middle of the year 1886. Practically, every mob of cattle, which were mostly bulls and breeding cows taken from Queensland to stock up the large grazing areas in the Northern Territory and Kimberley districts of South and Western Australia respectively, suffered heavy losses.

I had an opportunity of reading through many letters and reports written by the drovers in charge of these cattle and the stock inspector of the district on those occasions, and they all give a most graphic description of the disease we now know as "tick fever," but it is somewhat remarkable to learn that in no single instance were ticks mentioned. This may be accounted for by the fact that in these first mobs of cattle ticks were never in large numbers.

For several years the cattle in the Northern Territory bred and increased in numbers, and from the first gradually but surely acquired immunity to the disease. As a result of a series of good seasons followed by the very low price of fat cattle,

when it did not pay droving expenses to bring cattle from these distant parts to the Southern markets, two large boiling-down works were started to utilise the surplus cattle of the Gulf district; one of these was situated on the Albert River at Burketown and the other on the Norman River at Normanton.

SPREAD OF THE DISEASE SIMILAR TO THOSE IN AMERICA.

Now came a condition of affairs which, in every respect, resembled those that existed in the early sixties in America, between the State of Texas and Indiana, Illinois, and other northern States.

The Northern Territory cattle bearing the infection were, as a rule, free from any signs of the disease, particularly those coming into Queensland from the localities where the disease was first experienced. It was also demonstrated that the Northern Territory cattle did not directly communicate the infection to Queensland cattle, but that the ground over which the former passed was infected by them, and that the infection was transmitted from this ground to susceptible cattle, no matter whether they were local or travelling.

All that was necessary for the production of this redwater disease was the travelling of Northern Territory cattle over a stock route near the border in the Gulf district, and some time later, during the same season, for Queensland cattle to graze over the same area.

It was also shown that cattle from the Northern Territory lost, in some mysterious way, the power to infect other pastures, and were for the remainder of their stay in Queensland harmless. Again, cattle driven from the Northern Territory for some considerable distance in Queensland lost, after a time, the power to start fresh centres of the disease.

When stock routes over which for the first time these Northern Territory cattle had passed, it was observed that the disease did not appear at once in the local Queensland cattle grazing over these areas, but that a certain period of not less than four or five weeks elapsed before the local cattle began to die.

RELATION OF THE TICK TO THE DISEASE.

All of these interesting facts concerning what, up to that time, was really a mysterious disease were carefully reasoned out, and after numerous observations and experiments it was proved that in the red blood corpuscles of the infected animal there existed a peculiar micro-organism, resembling somewhat the germ of malarial fever in human beings. It was also discovered that somehow a certain species of tick was responsible as an agency for the transmission of the infection to healthy susceptible cattle.

These observations were soon after followed by further interesting experiments, which proved that virulent tick fever could be produced by placing recently hatched cattle ticks upon healthy, susceptible cattle, and also, that the disease could be communicated from one animal to another, and carried on through successive generations without the agency of ticks, but simply by the transfusion of blood containing the fever organisms, which were originally taken from a fevered animal. In connection with these latter experiments, I wish to pay a tribute to the memory of the late Dr. J. Sidney Hunt, whose valuable researches cleared up many of the difficulties with respect to these particular phases of the subject.

EXPERIMENTS WITH DIPPING MIXTURES.

It having been proved that ticks were solely responsible for the spread of the disease under natural conditions, and that fresh centres were started through their agency, and, further, that gross tick infestation, even in animals recovered from the disease, brought about a condition known as "tick worry," it was resolved that special attention be directed to the destruction of ticks upon the animal.

With this end in view, a large number of disinfectants and insecticides were experimented with, and while laboratory experiments were being carried out in Brisbane with ticks in various stages of their existence by immersing them in these fluids of different strengths for varying periods, dipping-vats were being constructed in cattle centres and particularly on some of the principal stock routes.

Information with regard to these matters was elicited from America, and large sums of money were spent in the purchase of numerous medicaments, including certain mineral oils, coal-tar derivatives, &c. Some of these were found to be injurious to cattle, while others did not effectually destroy the ticks.

Moreover, there can be very little doubt, owing to the indiscriminate use of these dipping mixtures, combined with a want of knowledge of the life history

of the tick on the part of those persons in charge of the dips, or the cattle that passed through them, the earlier dipping operations were, to some extent, responsible for starting fresh tick centres.

AMERICAN EXPERIENCE OF DIPPING CATTLE FOR TICKS.

Ever since the year 1895, the officials attached to the scientific branch of the Bureau of Animal Industry have devoted a great portion of their time in endeavouring to discover some mixture which will effectually destroy ticks on cattle without the latter being in any way injured.

Each year the annual report of the Bureau specially refers to these investigations. The following is an extract from the annual report of 1896, over twelve years ago:—"A subject of investigation which promised well was the application of mixtures to southern cattle with the idea of destroying ticks upon them and thus avoiding the danger of disseminating Texas fever. A considerable number of insecticides have been experimented with and marked progress has been made, but a thoroughly reliable mixture for this purpose has not been discovered. It is probably only a question of time and research when such a discovery will be made. The mixtures so far used which kill all of the ticks are too irritating to the skin of the cattle, while, on the other hand, those which are not irritating to the cattle do not kill all of the ticks."

After many years of experimentation a recent report gives the following:—"The southern cattle dip question remains without a wholly satisfactory solution. Many dips were tested during the year and were found to be unsatisfactory. The dips either do not kill the ticks or affect the cattle too severely to be of practical value. The ticks show a wonderful resistence to adverse conditions, which is entirely out of proportion with their small size. Among the dips tested, the best results were obtained from the so-called Australian dip, which has the following formula:—

"Stockholm tar	$7\frac{1}{2}$ gallons
"Carbonate of soda	23 lb.
"White arsenic	8 lb.

"Water sufficient to make 400 gallons.

"This dip is objectionable because of the arsenic it contains, and because it is necessary to dip an animal twice before all the ticks are killed. From the first dipping the cattle do not seem to suffer much, but as a result of the second dipping it has frequently been noticed that they refuse food for several days, act generally depressed, and have a more or less severe diarrhœa.

"The same dip without the arsenic at one trial gave very encouraging results, but when tried again, prepared with tar from another barrel, it proved to be almost without effect on the ticks."

A number of modifications of the Australia dip have also been tried, such as an increase in the amount of tar, the substitution of North Carolina tar for Stockholm tar, the substitution of other alkalies for the carbonate of soda, the addition of soap, &c.

No better results were obtained.

The addition of soap to the Australian dip containing arsenic killed practically all the ticks, but also some of the cattle dipped.

Dips containing as the main ingredients carbolic acid, tobacco extract, oil, sodium sulphate, glycerine, lime, and sulphur, and numerous other substances, either singly or in combination, have been tried and found too unsatisfactory.

This work is still in progress, and will be continued. Possibly, something may be done by combining a dip with a drench containing substances which will act on the tick through the secretions of the skin of the cattle.

PRECAUTIONS WITH REGARD TO DIPPING.

It must not be inferred from these remarks that I am opposed to the operation of the dipping of cattle for the destruction of ticks. On the contrary, I am of opinion that beneficial results must accrue when the operation is carried out in a judicious manner. Care must be exercised in using only a dipping mixture of standard value, one which will produce a maximum mortality among the ticks, and, which at the same time, causes only a minimum amount of injury to the cattle.

After dipping, cattle should not be unduly left exposed to the direct sun's rays.

They should not be driven any considerable distance to or from the dipping yards.

They should have plenty of food and good water.

During the very cold weather when ticks are more or less inactive, dipping should not be attempted unless in cases of gross infestation, as a large percentage of all cattle dipped before their heavy winter coat is lost suffer from a severe irritation of the skin.

The Difference between Dipping and Washing.

Many stock-owners are of opinion that a few gallons of a disinfectant solution applied liberally as a wash to a ticky animal would be equally efficacious as if the animal were passed through a dip containing the same mixture. But experience teaches us that the results of dipping and washing with the same solution are by no means alike. The positive result, the killing of the tick, is also in this instance conclusive. The solution which will destroy the parasite when applied to the host as a wash will also prove itself efficient when the animal is dipped in it. But the negative result—viz., that the wash has no disagreeable effect on the animal, does not prove that this will be the case when applied as a bath.

There are many kinds of dipping mixtures which, at a certain strength, may be applied very liberally to an animal as a wash, which will readily destroy the parasites without injuring their host. But if the same strength solution be applied as a dip, the animals which are immersed in it will barely escape with their lives.

It seems that the sudden exposure of the whole body, as well as the strong pressure of the solution against the body suspended in it, increased by the violent movements of the animal swimming through it, cause a deeper penetration into the skin than when the solution is simply poured over a quiet or well-secured animal.

Symptoms of Illness that may sometimes follow Dipping.

It may not be out of place to give a short description of the symptoms which follow immersion in too strong a solution of any disinfectant possessing caustic properties.

If the animal be a heifer or a cow it will urinate immediately upon reaching the dripping pen. This is caused by the irritation of the vulva, and of the mucous membrane of the vagina. A bull will kick the scrotum on which an exceedingly strong dip seems to have a very irritating effect. The dung is passed constantly until none is left to pass, but the animal continues to strain as if it had colic, is very uneasy, lies down and jumps up again, while saliva and mucous flow from the mouth. This state of irritation may last from ten to fifteen minutes, after which the animal either becomes quiet again and seeks for food or else passes into a drowsy state. In this state it stands with hanging head and drooping ears, and pays little attention to its surroundings. Its movements are slow and uncertain and often it lies down with head upon the ground. This state of drowsiness is also of short duration; the animal soon recovers and begins to walk.

Only in cases where the solution has been entirely too strong does the animal stagger or, so to speak, become "drunk," and, in some instances, fall to the ground, unable to rise. When this happens it is best to thoroughly wash the animal with fresh water, help it to rise, and lead it around for a while; it will then soon recover.

These extreme symptoms are seldom seen except when very weak or thin-skinned animals—especially those of a light colour—or young calves, either by mistake or carelessness, are allowed to jump in the dip.

If the animal is at all restless after leaving the dip, we may be sure that from three to five days later it will become stiff. How many days will elapse before the secondary symptoms appear is dependent upon the strength of the dip which was used, the age and condition of the animal, whether thick or thin skinned, and also upon the weather, if the animal is exposed to it after dipping.

Coarse-skinned, common-bred animals may be exposed to an excessively strong dip without showing any symptoms immediately after the dipping, but will, nevertheless, become stiff in due time. This stiffness which is caused by the caustic effect of the dip on the skin, which becomes hard and dry with brushy-looking hair, is in lighter cases of little consequence, and will disappear in a few days, being followed only by a slight peeling off of the epidermis on the more tender parts of the skin. These parts chiefly consist of the regions between the hind legs, those behind the elbow, on the lower part of the chest, the sides of the neck, and the dewlap.

In severer cases the skin in these places will fold in numerous wrinkles and subsequently crack in deep fissures, out of which the blood oozes, forming crusts with the desquamating epidermis. The animal moves with great pain, and may be

unable to lower its head to the ground to feed. Such extreme cases necessitate a radical treatment, in the form of a generous application of glycerine or oil, or anything at hand which will soften the skin and relieve the pain. Meanwhile the animal must be fed and watered, and must be sheltered against the sun's rays.

ACQUIRED IMMUNITY.

In the permanently tick-infested districts of the North, where the freshly introduced susceptible or uninoculated cattle readily die of tick fever, the locally-bred cattle do not suffer from this disease, although they carry in their blood the living germs that produce the disease in a fatal form in the unprotected animal. The question naturally arises: In what way have these Northern-raised cattle become immune? We have ample evidence as a result of carefully thought-out experiments that cattle in the Northern-fevered districts are not born immune, but acquire immunity. They undergo a process of natural inoculation while quite young; in fact, from the time they are born—that is, they become infested with "fever-producing ticks" which carry the micro-organisms of the disease. The young calf, however (whether it be born in England or North Queensland), possesses a high degree of resistance against the disease.

This natural immunity of a young animal is probably due to the greater activity at this period of life of those tissues that supply the red blood corpuscles the elements that are destroyed in this disease. Moreover, the young animal possesses more efficient means for destroying the invading micro-parasites, having relatively a much larger amount of lymphoid tissue for the supply of white blood cells or phagocytes, which are the soldiers as well as the scavengers of the blood. The *débris* resulting from the destruction of red corpuscles is also more easily disposed of by the young animal, the cells of the spleen and liver being more active. As the animal grows older, its immunity is maintained through the continued high state of activity of the red and white corpuscles, the constant presence of the micro-parasites acting as a stimulus. Further, in view of the recent researches with other diseases, it is also possible that the cells of the body of an immune animal may produce some substance of an anti-microbic nature, that limits to some extent the increase of the organisms in the blood.

Whether the views thus expressed as to the way in which the animal body protects itself are correct or otherwise, the important fact remains that all cattle that have safely passed through an attack of the fever are thereafter, as a rule, immune, and may be exposed to infection season after season without danger; and, so far as observation and experiment have yet shown, a permanent immunity cannot be established in any other way than through reactions that result from an attack of fever.

INDUCED IMMUNITY.

The problem then is to induce fever in the animal that is to be immunised, but at the same time to so control all conditions as to avoid a fatal issue.

With this information at our disposal it was decided to work out some scheme of protective inoculation of healthy susceptible cattle by artificial means, but experiments in this direction could only be carried out in a satisfactory and scientific manner, by first of all immunising a certain number of animals in a clean district, and then placing them with a number of unprotected animals on tick infested and fevered country.

THE FIRST PREVENTIVE INOCULATION EXPERIMENT IN QUEENSLAND.

On the 12th February, 1897, there arrived in Brisbane from Inkerman Station on the Lower Burdekin River, two young steers that had recovered from an acute attack of fever and were freed from ticks. Experiments were commenced without delay at the Indooroopilly Experiment Station. Blood from either of these steers when injected into a susceptible animal invariably produced a characteristic fever, the temperature rising from the normal 101·4 Fahr. to 103·6 on the tenth day, reaching the maximum of 106 or 107 on the fourteenth day, and subsiding to normal again by the twenty-first day.

After a number of these preliminary experiments had been carried out, one of the Inkerman steers was sent to Mundoolun Station, near Beaudesert, where Mr. William Collins had in waiting for me forty-one specially selected steers and heifers. These animals were inoculated in various ways with blood from the original Inkerman steer.

Some were injected intravenously and others subscutaneously behind the shoulder or near the tip of the tail. One animal had as large a dose as 10 cc., others had less; some having only 1 cc.

In one series the animals were each injected with filtered blood.

After inoculation each animal's temperature was carefully recorded night and morning, and at various intervals the blood was examined microscopically for the presence or otherwise of the tick fever parasite; also changes in the blood were observed, particularly the diminution of the red blood corpuscles.

The experiments were commenced on the 9th April, 1897, and by the end of the month four animals had died from tick fever, and the rest were on the road to recovery.

About two months later thirty-one of these animals, with three animals that had been injected with bile from a recovered animal, and twenty-two control or unprotected animals were sent away to Inkerman Station, arriving there on the 26th June. By the 5th July ticks were making their appearance on the cattle, and from this date the temperature of every animal was taken regularly night and morning till the 27th. By the 11th of July ticks were beginning to show larger, and on the 16th there were plenty of fully developed ticks upon the animals. By the 30th July every one of the twenty-two controls had suffered a severe attack of fever, and five had died; each of the three animals injected with bile had fever, and one died; while not one of the animals that had successfully reacted to the injection of recovered blood was affected with fever. The details of the experiments are given below:—

EXPERIMENTS WITH FILTERED BLOOD.

The object in these experiments was to determine whether, after passing blood from the recovered Inkerman steer through a Pasteur porcelain filter which excluded all micro-organisms, there still remained any substance in the nature of a toxine or antitoxine which might possibly bring about some reaction.

Four animals were each injected with 8 cc. and two animals received 4 cc. each of filtered blood.

Result, not one showed the slightest rise in temperature. Two of these animals were reinjected with the unfiltered blood, and showed a marked reaction.

The other four were sent to Inkerman, where they all suffered severely from tick fever, and one died.

INTRAVENOUS INJECTION OF RECOVERED BLOOD.

Four animals were injected direct into the jugular vein with 8 cc. and two animals with 5 cc. each of recovered blood. Result, all gave a pronounced reaction and remained immune after arrival at Inkerman.

EXPERIMENTS WITH SUBCUTANEOUS INJECTION BEHIND THE SHOULDER OF RECOVERED BLOOD FROM INKERMAN STEER.

Twenty-one animals were operated on. One had 10 cc., and reacted. Seven had 8 cc. each; of these six reacted, and two died. The remaining animals, which only gave a slight reaction, were, with the four others when they recovered, sent to Inkerman; the four remained perfectly well, while the partially recovered animals suffered from a severe attack of fever.

Five animals each received 5 cc. of recovered blood; all reacted, and one died. Four were sent to Inkerman, but remained unaffected. Five animals each received 2 cc. of recovered blood; three gave a good reaction. Two of these were sent to Inkerman, and remained unaffected. One gave no reaction, and another gave no reaction; these two animals had a severe atack of fever.

Three animals each received 1 cc. of recovered blood; one reacted and remained unaffected at Inkerman. The other two gave no reaction, and soon after their arrival at Inkerman one suffered a severe fever and the other died.

INOCULATION UNDER SKIN NEAR THE TIP OF THE TAIL WITH SMALL QUANTITIES OF RECOVERED BLOOD.

Three animals were injected with 2 cc. each; two reacted, one of which died; the other was sent to Inkerman, but remained immune. The third one failed to react, and suffered severe fever after arrival at Inkerman.

Three animals each received 1 cc. of blood in the tail; two reacted, and remained unaffected when sent to Inkerman. The other failed to react, but suffered high fever at Inkerman.

The Mundoolun-Inkerman experiment was, therefore, a pronounced success, and preventive inoculation for tick fever had become an accomplished fact.

It was not long before the method was availed of by many stock-owners; but those who took the keenest interest in the matter were to be found among the

station-owners of the permanently tick-infested districts in North Queensland. Up till this time whenever any stud or herd bulls, particularly those of mature years, were imported from the southern states were placed on these Northern stations, they invariably died of tick fever; but now, by carefully carrying out in all detail the instructions given in the pamphlet on the "Technique of the Method of Preventive Inoculation for Tick Fever," cattle can be immunised, and when completely recovered from the inoculation fever can be sent to the worst fevered districts, with a minimum of loss.

Some Facts Concerning Inoculation.

Twenty-six Devon bulls intended for North Queensland were inoculated and placed in a good paddock with plenty of green feed, fresh water, and shelter from the sun. About the twelfth day a number appeared very sick, refusing food, &c. The next day the man in charge thought it would be a good thing if they were removed to another paddock, which he did, but this man's good idea turned out to be a bad one, for the next morning six of the bulls were dead.

On the next occasion the owner placed his second lot of forty-two Devon bulls under my supervision. They were all inoculated and placed in the usual good paddock, but were left undisturbed. At the end of a month we found all the forty-two bulls on the road to recovery; as each of the control animals at Indooroopilly had given a good reaction. I took the risk, after the bulls had been inoculated six weeks, to inject each one with a syringeful of virulent blood from an animal just about to succumb to tick fever, with the result that not one of the bulls were affected.

They were then shipped to a station just north of Townsville, and turned out on the tick-infested and virulent fevered country.

About six months later the owner informed me that the bulls were doing well. Three years later there was a general bang-tail muster, and every one of the forty-two bulls was accounted for. On Friday last, the same gentleman informed me that he had not lost one of these forty-two bulls.

This experiment is, perhaps, unique, for it rarely happens that every animal reacts to inoculation (even with the best of proved blood) the first time.

As an illustration, I may mention the case of a well-known Jersey bull that was purchased in Brisbane for the Central district. This bull was inoculated with three steers; the latter reacted, but the bull, to use a stockman's phrase, "never turned a hair."

He was inoculated a second time with three other steers; the latter became very sick and one died, but still the bull remained refractory.

He was inoculated a third time with some more steers, but on this occasion he joined company with them, for they all reacted. The bull's inoculation fever was very pronounced, but he recovered, and after a few weeks' rest was transferred to the tick country, where he enjoyed perfect immunity.

Inoculation Maxims.

Although the operation of immunising cattle by protective inoculation is not a difficult one, I cannot emphasise too strongly that, in order to obtain the best results, the following maxims must be specially observed:—

1. The operator must familiarise himself with the nature of the disease.
2. Absolute cleanliness.
3. Disinfection of the skin on that part of the neck of the immune animal where the trocar is introduced for drawing the blood.
4. Sterilisation before use of all the appliances concerned in the inoculation process—glass jar for collecting the blood, feathers for defibrinating, and muslin for straining to be boiled and subsequently dried in the sun or an oven. Trocar and canula neddles, syringe, and tubing to be thoroughly washed and rinsed in hot boiled water.
5. The washing and sterilising of all appliances immediately after use.
6. After the blood is drawn and defibrinated, it should be used as early as possible to prevent decomposition.
7. Special care must be exercised in order to avoid the blood becoming contaminated.
8. Remember that a clinical thermometer is indispensable to indicate the course and severity of the inoculation fever.
9. It is advisable, wherever practicable, to prevent any ticks from getting on the cattle until at least eight weeks after their inoculation or until they have fully recovered.

10. During the inoculation fever the animals should have plenty of shade, free access to green feed and fresh water, and disturbed as little as possible.
11. Animals from six to eighteen months old are immunised with greater safety than adult animals.
12. The best results are obtained by inoculating cattle during the autumn months.
13. The quality of an immune animal's blood can only be determined by making a practical test of it—that is, by injecting it into several young susceptible animals and recording their temperatures from the tenth to the twenty-first day after inoculation.

THE ENVIRONMENT OF RECOVERED ANIMALS.

I agree entirely with Dr. J. W. Connaway, the Chief Veterinarian of the Missouri Experiment Station, that an animal is immune only so long as the cells of its body are able to counteract the effects of the micro-organisms, by destroying many of them, thus keeping their numbers within bounds; by rapidly replacing the injured red corpuscles, and by quick and efficient removal of deleterious waste products. It is apparent from the very nature of the case that immunity in this disease is not a fixed state, but is as variable as the vitality of the infected animal. Any condition that tends to lower the vitality of the animal lessens its power to resist disease.

I have seen cattle bred in Northern or permanently tick-infested districts die of tick fever, presenting all the essential features of that disease, such as an anæmic emaciated condition through loss of red blood corpuscles, yellow-coloured liver, gall bladder distended with thick dark-greenish granular contents, enlarged and friable spleen, and dark-red coloured urine. The circumstances that brought about a fatal result in these cases were, however, out of the ordinary. The animals had been rapidly travelled during the winter from the warm climate of the North to the colder one of the South; if anything, they were in an unthrifty condition, were fatigued from the long journey, and further depressed by dipping in a cold bath to destroy the ticks. This combination of unfavourable circumstances brought about such a state of depression that the micro-organisms of the disease (which by the way are invariably present in a recovered animal's system) got the upper hand of those cells that are concerned in maintaining immunity.

In the case of imported bulls bred in the old country and the colder parts of the southern states, they encounter in Queensland, particularly in the North, the enervating influence of a warmer climate; and it is probable that with some inoculated animals at least one full summer is required before a complete adjustment to the climatic differences is effected, and before the degree of immunity possessed by a Northern fevered-district bred animal is attained. North and Central Queensland stock-owners should, therefore, give their inoculated imported bulls extra attention during the first season, so as to prevent as much as possible over-heating, over-service, excessive tick infestation, fatigue, dietetic disturbances, and other depressing conditions.

EXPERIENCE OF OTHER COUNTRIES.

In the United States the Queensland system of preventive inoculation for tick or Texas fever is universally adopted, and has proved to be the means of not only saving large sums of money annually, but, to the ranch-holders in the permanently tick-infested country, what is of the most vital importance, the continued improvement of their herds by the introduction of the best pedigreed stock. In pre-inoculation days this was well nigh an impossiblity, for in the case of bulls the losses were so appalling that many of the cattlemen had to resort to in-breeding. Preventive inoculation for redwater disease in South Africa has been most successful, the quantity of recovered blood to be injected in the animal to be immunised being the same as that in use in Queensland—viz., 5 cc.

ADVICE OF PROFESSOR KOCH.

I feel I cannot leave the subject of dipping and the inoculation of cattle without referring briefly to Professor Robert Koch's fourth report on "African Coast Fever" a specific disease very closely analogous to "Australian Tick Fever," being caused by a characteristic blood parasite, which lives and multiplies within the red corpuscles, and is communicated only by ticks.

Too much value cannot be placed upon the remarks of such a learned authority as Professor Koch, who says that the destruction of ticks by spraying or dipping is advantageous and helps to check the spread of the disease, particularly when combined with fencing. The discovery of a *certain* and *safe* method of destroying *all* ticks, which so far *we have not* at our command, would arrest any further spread of the disease.

A clean herd can be protected by careful isolation from suspects, particularly from such animals as have had the disease and recovered from it. For this purpose fencing is beneficial.

After the disease has appeared in a herd, movement of such a herd to clean country from time to time, particularly after outbreaks, is beneficial, and will sometimes suffice to free it from infection if the conditions are favourable.

Clean country is only such country upon which neither sick nor recovered animals have grazed for at least twelve months.

Such expedients as fencing, dipping, spraying, and moving animals have only a *temporary value*, as sooner or later the disease will extend to and involve all herds in the vicinity of an infected centre, as Texas fever did; therefore, such precautions should be *supplemented by inoculation with recovered blood* whenever the disease makes its appearance in the vicinity.

Conclusions Arrived at.

Tick fever and redwater disease are synonymous terms.

The disease under natural conditions is caused solely by ticks.

Careful dipping with properly prepared mixtures will effectually destroy the majority of ticks upon an infested animal.

Systematic dipping will prevent tick worry.

Continued dipping will not prevent cattle from being attacked by the disease, "tick fever."

Susceptible animals may be rendered immune by inoculating them with blood from a recovered animal.

The losses from the inoculation fever vary from nothing to 8 per cent., according to circumstances, particularly the age of the animals.

By protective inoculation over 90 per cent. of cattle are saved.

In uninoculated cattle the losses may range to as high as 100 per cent.

The Chairman: Before the Conference proceeded with the next paper, he would, with their permission, ask Mr. Brünnich, who had a great deal to do with the preparation of the mixture used for dipping, to give them a few remarks in connection with Mr. Pound's paper on the subject of dipping from a chemical point of view.

Mr. Brünnich: Mr. Pound, in his paper, had referred to certain remarks made by American stock inspectors on the failure or otherwise of dipping solutions, and stated that, even by a very recent report, American authorities were not satisfied with their dipping mixture. He had further also spoken about dipping mixture having a caustic effect on skins, and as to the strength of the dips. He could not criticise his remarks on this point, as he did not know what strengths he referred to.

Mr. Pound: I gave the formula given for the Departmental dip.

Mr. Brünnich: The formula given in this report was four or five years old. The great difficulty was really to decide what strength the dip should be. In the present dip they were using 4 lb. of caustic soda per 400 gallons of water. That meant one part of caustic soda for a one-thousandth part of water. This, even if the caustic soda would not change itself later on, would not be called caustic at all, because you could put it into the eyes or on a tender part of the body without any caustic effect at all. They could use a much stronger solution than one in a thousand without any caustic effect. There could be no doubt that even their present dip, which he called a weak solution, could have some injurious effect on the cattle if common-sense points were not observed. If cattle, for instance, were heavily driven and heated, and all the pores of the skin opened, and were suddenly immersed in this dipping mixture, naturally they would absorb a certain amount of poison.

Again, if cattle were standing in the hot sun, even with water only they might be scalded. He only wanted to clear up the point which might be inferred from Mr. Pound's paper, that their dipping mixture could be called in any way strong and caustic. During the years that dipping mixture had been prepared they had gradually altered the quantities, substituting, for instance, caustic for washing soda, and the mere fact of doing this had caused quite a scare amongst a lot of stock-owners in thinking that the name caustic alone made it more dangerous. The 4 lb. of caustic soda was really less dangerous than the 24 lb. of soda used in the original formula. In the preparation of the dip itself the caustic properties of the soda became neutralised by the arsenic; the dipping solution was almost neutral to the reaction, and could not be called caustic in any way. If there should be any caustic soda free by way of being used, carbonic was in the air and acted on it, and it would form into carbonate of soda afterwards. So that, in the dip, it did not matter how it was prepared, nor whether it was washing soda, to which a good many men adhered because they did not know any better. Whether caustic soda or washing soda was used, in a year's time no chemist could tell the difference, and he was quite sure, therefore, that no practical test by dipping could be made showing the difference of quantities. In regard to our preparation of dips, Mr. Pound had said that American tests had shown that one dipping did not destroy the ticks. He did not think that was borne out by our local experience, and he would like to hear the experience of our inspectors as to whether one dipping killed the ticks or not. So far, they had found that every dipping or spraying with our mixture would kill ticks in a reasonable time—say in four days. Furthermore, he believed that dipping also affected the fertility of female eggs before they laid, but that was only a side issue. Now, about the preparation of the dips. Laboratory experiments, in which the tick was immersed in solution and allowed to stop for periods of from two to ten minutes could hardly be compared with the immersion of the same tick by dipping or spraying the cattle. In the latter cases the animal was only immersed for a second, and came out again, and the poisonous water rolled off the tick. All dipping mixtures must have something added to them to make a certain amount of film of the dipping fluid adhere to the tick. Ticks had a certain amount of greasy nature in them, and pure water in which arsenic was dissolved would run off and not leave enough poison on the tick to kill it. For this reason several substances had been added. They had found that Stockholm tar was one of the most adhesive substances. Naturally, it made it more adhesive to the animal too, but, as Mr. Pound had quoted from the American authorities, they must put something in the dip to kill the tick, and it must affect the hide also, as you cannot do one without the other. It was for us to find out the minimum quantity of severe ingredients which would kill the tick without affecting the hide of the animal. The quantity of tar had been reduced, and they were at present using 1 gallon in 400, which was really the minimum quantity. They had used ordinary tar, but they found that Stockholm tar of a good quality was the best. The quality of Stockholm tar varied a great deal, and very often oils were contained therein, which did not dissolve by boiling with caustic soda, and they floated on the dip mixtures and gave an ill effect. They always found that in dips which contained free oils floating on the surface, as soon as the animal was immersed, numerous pieces of animal matter adhered to the cow, and caused severe scalding, and for this reason the tar used must be of the very best quality. They added tallow to the dips in place of soap used in olden times. They made the soap themselves, but tallow had to be got from other places, and, by simply treating with caustic soda it left an amount of glycerine in solution which had a healing adhesive effect. In the preparation of dips great care had to be taken to get all the ingredients properly dissolved, and for this reason, if anybody asked him "Would you recommend me to form it myself, or get one of those prepared

mixtures in the form of concentrates?" he would say that he really believed that concentrates were handier for anyone. They were thoroughly mixed and dissolved, and made according to our formula, and there was less trouble in their preparation; otherwise, there was no real difference. One thing to be watched was this: If anyone was using concentrates, and were not careful to get the tins completely emptied and all ingredients out, they could never depend on the strength of the dip. Even when they got samples to use in the laboratory, and thought they had got all the arsenic out, they had not done so. They must wash it out in order to get all the arsenic out with solution. On this account they got some extraordinary results. The dip was either too strong or too weak, because the person who prepared the dip was not careful enough to get the tins properly cleansed and washed out before using for a dip. Some had referred to carbolic. In all the experiments carried out by Dr. Hunt and others they had found tar, and particularly carbolic, had no killing effect on the tick, and he could not see why a lot of makers insisted on using carbolic in the preparation of dip, it had no effect on the ticks whatever, but they thought it had a healing effect on the skin. He believed that it had the very opposite effect, it had rather an irritating effect, and it seemed that carbolic in combination with the arsenic formed a more poisonous compound than the arsenic would be. They found that any poison in combination with an arsenic compound seemed to have a more poisonous effect, and had a bad effect on the animal. For this reason he would not recommend carbolic with arsenic in dips. There was no doubt that arsenical dips were the best, and that 8 lb. to 400 gallons was the minimum quantity of arsenic that could be used. In hot weather they might go down to 6 lb. and get good effects, but 8 lb. was best. In cold weather the amount of arsenic might be slightly increased. With regard to the difference between dipping and spraying, which Mr. Pound had mentioned, he did not think it was in his province to deal with that, although he did not think the results which Mr. Pound mentioned were quite in accord with our own experience.

Mr. R. S. ARCHER (Rockhampton) forwarded the following paper, which was read by Mr. ORR:—

THE CATTLE TICK.

(Paper by R. S. Archer, Gracemere, Rockhampton, read before the Conference on Ticks and Tick Fever, at Brisbane, 6th May, 1907.)

The cattle tick first made its appearance in Central Queensland about 1896, and for the succeeding four or five years caused heavy losses amongst our herds. Cattle owners at first were divided into two parties, one advocating inoculation, the other dipping, as a sole cure for tick trouble. In time we found that both processes were necessary to save our stock. Inoculation to render them immune to the tick fever or redwater disease, which eventually within one, two, or even four years after the appearance of ticks always caused a mortality of 50 to 80 per cent. in uninoculated cattle. Dipping to save our stock from tick worry, as the cattle soon became so heavily infested that when feed became at all dry and innutritious, they were worried to death without any of the symptoms of redwater. At that time inoculation with the blood of animals recovered from the disease was in the experimental stage, and with the assistance and advice of Mr. Barnes, our then Government Veterinary Surgeon, I carried out some small experiments. These satisfied me that inoculation with recovered blood was a preventive of redwater, when reaction was produced—*i.e.*, the inoculation caused a mild attack of the disease.

Also that cattle may for many months be tick infested without suffering from redwater, and that tick infestment however severe was no proof that an animal is immune, as some of the authorities at that time stated. I then proceeded to innoculate our herd, some 4,000 head, and found that, like most new methods, inoculation was by no means perfect. The blood of some recovered animals was most severe in its effects, causing losses from too heavy reaction, sometimes up to 10 or 15 per cent., and even heavier in bulls.

In young animals the deaths were always lighter than in full-grown stock.

Again, some recovered blood produced no reaction, and the inoculated animals were, therefore, not protected from the disease. A few months after our inoculation was finished the wave of redwater came through the district, and we lost from 8 to 10 per cent. of the herd, these being the cattle that had not reacted; our total losses from inoculation and fever produced by ticks being 15 to 20 per cent. Shortly after inoculating our herd I put through some of our neighbours' cattle, and, benefiting by my previous experience, they came through with a total loss of 5 or 6 per cent., while in most uninoculated herds in the same neighbourhood hardly a grown animal was left alive.

The late Dr. Hunt tried several ways of minimising the severe effects of inoculation, especially in bulls, such as carbonising the blood, mixing with water, and using a very small dose, but without any very satisfactory results; subsequently I always tested the blood of bleeders on small mobs of cattle, before using it extensively, and found that some blood produced a mild reaction, which fully protected, while other blood had too severe a result.

The mild blood was then first used, and then within two months the animals were given a dose of the severe blood, and until natural fever produced by the ticks appeared the innoculation was repeated every three months.

Our Torsdale herd was put through on this plan with a total loss from inoculation and subsequent fever of 6 to 7 per cent. At that time forty Torsdale bulls inoculated three times, but which had never had a tick on them, were travelled 250 miles through redwater country and delivered without loss, and were all on hand twelve months later. As to dipping we were told, as I understand many southern dairymen have been told to their cost, that dipping would keep away redwater. To test this statement I trucked ten head of clean cattle from the west, and turned them on to our redwater country. The day they arrived they were dipped in the standard arsenical mixture, and were afterwards dipped regularly once a week; within four weeks eight of the ten head were dead from redwater proved by *post-mortem* examination.

This proved to me that dipping will not keep away redwater, and in the subsequent ten years I have seen nothing to make me alter my opinion. The effects of the dip mixture in the animal's hair wears off in a day or two, the tick gets on to its host, and in a few days is attached to the hide, and if pathogenic is introducing the redwater germ into the animal's blood, how then can dipping, which in ordinary practice, cannot be carried out oftener than every two or three weeks, keep off the disease?

Dipping is most necessary to free cattle from tick worry which sometimes causes heavy lossses in undipped stock.

Without dips on ticky country, milk returns are reduced 50 per cent.

After natural fever produced by ticks first appeared, and a very heavy percentage of the uninoculated cattle in the district died, there were a few cases of fever among the stock for the next two or three years.

For the last five or six years, however, I have not seen a case of redwater, except in cattle brought from clean country.

Our own cattle show no sign of the disease, and the calves seem to be born naturally immune, as we do not inoculate them and they remain perfectly healthy, while cattle imported from clean areas quickly develop the disease.

In conclusion, I would urge all cattle-owners who have, or who are threatened with ticks, and have not had redwater through their herds to inoculate without delay, and to use, where procurable, the blood of tried bleeders, where practicable taking temperatures, remembering that inoculation is of no value unless there is a reaction.

In large herds where temperatures cannot be taken, it is advisable to reinoculate two or three times, as a percentage always fail to react.

At the same time, dips should be erected to cleanse the stock and check the spread of the pest.

The Stock Department could greatly assist by procuring and testing bleeders, as there is undoubtedly a great difference in the effects of the blood of different animals.

How these differences arise is well worth the investigation of our scientific men, or of our long talked of Federal bureau of animal industries, which we hope to see established on the lines of that of the United States.

The tick question is now more a Federal than a Queensland problem.

The greatest extent of our coast country, where ticks will live and thrive, has already gone through the mill, and we now look on ticks as one of our everyday troubles, which we have not time to worry about.

With the southern States it is different, the ticks are already in New South Wales, and although quarantine lines, fencing, dipping, &c., will retard them, it will never stop them, and in time they will spread south as far as climatic conditions allow.

Is there sufficient frost on any of the Australian coasts to form a climatic tick line as in the United States?

NECESSITY OF INOCULATION UNDER DEPARTMENTAL CONTROL.

Mr. C. J. BOOKER (Wide Bay), who was unable to attend owing to pressure of business, forwarded a paper on this subject, which was read by Mr. ORR. The paper is as follows:—

With your permission, I would like this short paper to be accepted as a suggestion to the Stock Department to take up the work of inoculation. The good work of Mr. C. J. Pound should be further carried on. Mr. Pound should again take up his work in the Department; train a number of smart young cattle-men; secure a number of proved bleeders; have these men ready to go out in the early spring to begin operations. Place them under the stock inspectors in the various districts. Stock-owners to notify the stock inspector of their district as to the number of cattle they require to be inoculated. The charge to be 3d. per head. This sub-department would be self-supporting. Careful inoculation with the blood of a *proved bleeder*, will, I am confident, give safe results. My ten years' experience has satisfied me that inoculation is the only absolute safe course. There are periods in every cattle-man's experience, when dipping cannot be carried on. It is on these occasions when losses from tick fever occurs. A stock-owner, by regular dipping, may keep his cattle clean and free from losses for a long period, but should it be necessary eventually to travel these cattle through *grossly infested* country, he may dip them a few days previous to touching the infested area, but his losses probably will be very heavy. Inoculation gets over this difficulty. This has been my experience.

INOCULATION AS A PREVENTIVE FOR REDWATER.

Mr. S. KELLY (Yandina) read the following paper on this subject:—

With the cause of redwater I leave others to deal; the effects I intend to touch sparingly. Having seen during the last five years some hundreds of cases and upwards of thirty different remedies tried, I am long since convinced there is no absolute cure. Inoculation, if carried out systematically, can be vouched for as a preventive for this one of the worst diseases that stock-owners of Queensland have ever had to contend with. The fear of losses seems to be the chief factor operating against inoculation: some means should be tried to remove this. My own experience in treating a herd of between 200 and 300 head of mixed cattle, shows that less than 5 per cent. could be guaranteed to cover the losses; in carrying this out no stock specialist or professor is required. Get a steer or heifer (steer preferred) between the ages of one and three years; at these ages they are less susceptible to disease than at an older stage. Common sense will appeal to a cattle-man not to select anything that is not in good condition and, therefore, apparently healthy. Of course, this beast must be recovered not less than three weeks from redwater or inoculation; the latter preferred. Take from the jugular the blood required—say about 1 pint to treat 100 head. To obtain this, you must draw fully 1 quart from the beast; the coagulated blood must be removed by stirring, then strained into a clean vessel, and corked or covered, to prevent flies, dust, or filth getting into it, and should be used within four hours of taking. Experience teaches that using it after this time it is seldom effective, and invariably causes a lump to form and fester where the needle has been inserted. Where dipping has to be carried out, very little extra time is required to inoculate; crush them up as tight as possible; and when treated let them go through the dip. If the blood reacts, symptoms will show from the eighth to the eighteenth day, and, unless the temperature of each beast has been taken, they should immediately again be inoculated; follow on for a third time, as reaction of 30 per cent. on each occasion is considered successful. Cattle

should be kept as quiet as possible during the time intervening between treatment and reaction. I cannot vouch for how long a beast will remain immune from redwater; but I positively state that if the temperature has reached 106 degs. it is safe for four years—not so, after recovery from redwater, as in some instances a second attack follows in a few weeks and invariably proves fatal. I might mention what, although a fact, and as far as I am aware unaccounted for, is that the blood of not more than 20 per cent. will react on others. Cows carrying young should not be treated. If in profit they will, for that season only, probably not yield their previous quantities. No bad effect is noticeable after recovery from inoculation—not so after redwater, as about 12 per cent. succumb to complaints for which redwater has been the direct cause. I would advocate that the Government make this safe and inexpensive preventive compulsory, also dipping; and that concessions in freights be granted where proof is produced that cattle are travelling from one district to another for the purpose of supplying blood. I consider the time opportune and the means obtainable for arresting the progress, if not stamping out entirely, this much-dreaded disease.

TICKS AND TICK DIPPING.

Mr. G. L. DEBNEY (Bowen) forwarded a paper on this subject, which was read by Mr. ORR, as follows:—

Has the cattle tick *Ixodes bovis* come to stay or are there any means that can be devised to eradicate the pest? This is a question well worth the consideration of every one engaged in stock-breeding throughout the State. It was a sorry day when the pest made its appearance among our herds, and as long as it is allowed to exist, the expense, time, trouble, and loss, will always be an obstacle to the carrying on of the industry.

Dipping in the arsenic solution appears to be the most effectual means at present known—when resorted to frequently—but so far has been futile in making any apparent difference, and until concerted action is taken this must be the case. At present not one-half the cattle in tick-infested country are dipped, and those who do use this means to eradicate the pest in their herds are handicapped by the cattle belonging to those who do not trouble themselves in the matter. The only method likely to succeed is compulsory dipping under Government supervision, in dips erected and maintained at Government expense, so as to allow everyone, from the largest cattle-owner to the smallest, to make use of them if he likes, at a reasonable cost. The cattle to be dipped at stated intervals. Many large owners have already been to the expense of erecting dips, therefore, would not require to use a Government dip, nevertheless they would be under Government supervision, and be compelled to dip their cattle at regular intervals the same as the others.

Many will, no doubt, deride the idea of the tick being ever eradicated, this terrible little parasite having too great a hold on our herds. Only a few days ago, when in conversation with a friend from a neighbouring State, the writer was reminded of the scab that existed among the flocks of the southern States in the early days, and this set me thinking about the tick evil in this State. I remember when the whole of the flocks in Victoria and South Australia were infested with scab, almost without exception. Here and there, possibly, a few flocks grazing on country too dry for them to exist were free, much the same as in the far Western country ticks cannot exist; but with these exceptions scab infested the flocks, and it seemed almost hopeless to expect that any means that could be devised would ever free them from the parasite that caused it. What has become of the scab in these States? It has practically ceased to exist—wiped out by a methodical system of dipping under Government supervision. Whether the tick can be eradicated in the same way remains to be proved. I contend that it is well worth a trial—in fact, it is the duty of the Government to leave no means, having a probability of success, untried to rid the country of the pest. As long as it exists in our herds the loss caused by worry to the cattle means a considerable decrease in the milk and beef supply in the coastal districts of the State. After the wet season is over the ticks increase rapidly, and the effect is an almost immediate falling off in the milk supply which may be mainly attributed to the pest. The tick is also the reputed agent in spreading disease such as "redwater," and may, unless checked, be the means of spreading other diseases

should they ever gain a footing in this State. With dips within the reach of every owner of cattle, at a small charge to cover the cost of the solution and interest on the outlay in erecting the dip, no reason can exist for anyone owning cattle to neglect to dip them at regular intervals. The ultimate effect of this, if carried out, systematically must be a considerable decrease, and in time the extinction of the pest. Of course, due regard must be paid to the prevention of cattle entering the State from the Northern Territory, unless proved to be thoroughly clean. The writer contends that if the scab could be eradicated from the flocks of the southern States, as it undoubtedly was, that a probability exists of doing the same in the case of the tick.

Mr. H. R. Moon (Brookfield) forwarded the following paper, which was read by Mr. Orr:—

VIEWS OF A FARMER.

Redwater and Tick Fever.

From my observation in treatment of redwater and tick fever, I offer these remarks, not claiming scientific accuracy for what I have noted. They are simply remarks which may afford some material for useful discussion, and, perhaps, assist others in getting to a desirable determination of the disease which has been so severe a scourge to many farmers in Queensland.

"Redwater" is a specific infectious disease of the blood of cattle, caused by the development of minute animal parasites, which are conveyed by contagion and inoculation by the tick. Tick fever is a blood poison caused by the cattle tick in like manner to the affection of dogs by means of the scrub tick; therefore, I believe that the farmers of Queensland have to contend with two distinct diseases often combined. First, I will endeavour to deal with redwater. I believe the disease, as known in England and other countries, has also been in Queensland for a long time. I have heard of bullock-drivers losing cattle twenty-five or thirty years ago from redwater. The disease made no great headway until the tick pest came, picking up the disease by contact with cattle affected, and spreading it through country, thus combining the two diseases. Therefore, I believe that the combined disease is contagious by germ or microbe, and set up by inoculation from the tick. We often see beasts suffer and die from redwater and tick fever, and others suffer alone from tick fever or blood poisoning. The former is a much more fatal form of disease, cattle dying in from two to three days, with a loss of 80 to 90 per cent. of stock affected. On the other hand, we find cattle suffering from tick fever or blood poisoning alone. This form takes much longer to develop; in some cases beasts linger on for two or three weeks. The loss is not so heavy—I would say about from 40 to 50 per cent. of stock seriously affected. As an example, take four farmers, A, B, C, and D. A's cattle are suffering from redwater and tick fever. B's are still clear of disease. C's are suffering from tick fever or blood poisoning. D's herd is as yet clear of disease. The disease amongst A's cattle is very fatal, and ticks therefrom transmit to B's, which suffer in like manner. The disease amongst C's is not so fatal, and ticks from C's affect D's cattle in the single form—blood poisoning. Therefore, a remedy must be found to combat the two diseases. I do not think the drenches and other methods we have at present of treating the disease are effectual. It is of course well to resort to relieving measures when stock are sick, but what is wanted is a thoroughly scientific and approved method of prevention. If that is to be inoculation, the greatest care must be taken to see that the supply of serum is sound and in proper condition. Inoculation in some cases has proved more deadly than the disease.

We have in the case of snakebite the strychnine antidote, and other means of dealing with blood poisoning. It remains with our scientists to apply this to the blood poisoning of ticks. We have general bureaus dealing with chemistry and bacteriology, but the Department of Agriculture requires a sub-department to deal with animal diseases.

The Government should assist the local authorities in the erection of dips, and also offer some encouragement to farmers combining to erect dips. Dips could be erected all over areas of the State which are infested, and a charge made of, say, 3d. per head, until they were paid for, and then reduced to 1d. per head which would cover cost of dipping. Further, the Government should deal very strictly with tick-infested stock found on the Government roads. If several local authorities were to combine, they could employ an inspector between them to watch over the interests of the several shires.

The dairy inspectors could also, without any extra cost to the country, be instructed to warn owners of stock of their liability, and inform the local authorities of people allowing infested stock to run on the roads, as this has been a source of serious annoyance to the farmer who tries to keep his cattle clean. Stock could be identified by the brands. It is not really known how great the loss that this dreaded disease has caused and is causing at the present time in Queensland. There have been thousands of deaths of cattle that have never been heard of, as farmers have tried to keep their losses in the dark, knowing it would spoil the sale of their stock. It has reached such dimensions now that it is very seriously affecting stock sales and the dairying industry in Queensland.

In many cases farmers let their earnings of years go for a mere trifle, rather than run the risk of losing their stock by the disease. It is really sad to see farms, which were once comfortable and well stocked, in many cases devoid of stock altogether, and others only merely eking out an existence. It is no wonder that the farmers' sons are now leaving their homes, where once they had plenty of work, and are seeking their fortunes in the cane fields and elsewhere. The disease will lie dormant to a great extent during the winter months, but farmers have a great dread of the coming summer, and many will sacrifice their stock. It is, therefore, to be hoped that the Government of this great State will realise their responsibility in taking urgent and energetic steps to deal with this dreaded disease without delay.

DISCUSSION ON PAPERS.

Mr. CHARLES (Wide Bay) asked Mr. Pound if he had inoculated any cattle in clean country, and kept them there for two years before they had been sent into tick-infested country?

Mr. POUND said he had inoculated large numbers of animals which had been utilised principally for the supply of blood to inoculate animals in districts where the pest was approaching or had appeared. He did not know whether any of Mr. Collins's animals had been sent away North after any lengthened period.

Mr. COLLINS: Only the ones recently inoculated. We have never sent away animals from which we took the blood.

Mr. POUND thought the longest period they had was in the case of bulls, where they were only too anxious to get them away in the shortest time. Their services had been required in Northern districts, which had been devastated of bulls. If they had animals here that had been inoculated for tick fever and recovered, if they had been inoculated with virulent blood or their blood would produce reaction, it was the same as going away to Northern districts. He remembered that at the late Mr. William Allan's place, "Braeside," they had a steer for a number of years into which the injection of virulent blood produced no effect, and likewise at Indooroopilly. If an animal's blood gave a reaction, and they inoculated that animal, no matter for how many years, they could not produce a reaction in the animal, it was immune.

Mr. CHARLES: Provided it has been infested with ticks in the meantime.

Mr. POUND: No; if an animal has recovered from tick fever, its blood gives a reaction six years afterwards.

Mr. COTTON: Have you had a beast in clean country six years, and then got a reaction from that beast?

Mr. POUND said he had given some cases on the Downs, and then there were others in America. Those were put up as records, as animals which lived outside tick country for eleven and thirteen years. He agreed that it was an exception, and might not be the rule.

Mr. COTTON: It is the opinion of most people, I think, that to keep the cattle immune you keep the ticks on them.

Mr. POUND: Mr. Cotton was now trenching on a point he was going to refer to in connection with another paper. Take, for example, the present state of affairs in Queensland. About eight or ten years ago we started these inoculation experiments, and seven or eight years ago inoculation became systematic. They were all aware how many districts he visited, and gave practical demon-

strations of inoculation. He made many trips to the Central districts, Blackall Range, and South Coast districts, and took with him immune animals. The people in those districts carried on this work for a time, as there were fairly good seasons. Then the drought came on, and not only cattle, but the ticks disappeared, and the inoculation question fell into obscurity.

Mr. COTTON: Were there any ticks here at that time?

Mr. POUND: Certainly. I am not saying ten years ago. While the Inkerman steers were at Indooroopilly there was a lot of trouble to get them away. Before the paddocks at Indooroopilly had ticks, they were fairly plentiful around the Enoggera saleyards. It was certainly six or seven years since ticks were introduced at St. Helena, became established, and they were there still, so it was quite seven years since ticks made their appearance in Brisbane. The inoculation system dropped altogether in consequence of the drought, but the ticks did not disappear. There were still a few, but not in sufficient numbers to cause people any inconvenience. They never increased to any large extent, and dipping and inoculation stopped, and general interest in the question was dropped. A few years ago we had a return of good seasons; rain came, and there was a plentiful supply of grass; the cattle increased in numbers, and the ticks correspondingly increased. In some places ticks went on increasing, but most cattle owners in those districts expressed the opinion that they did not think ticks would do them any harm, and they had never been inconvenienced by them. They had had them for years, and why should they inoculate? This state of affairs went on until last year. Tick fever had now made its appearance. He maintained that on the advent of good seasons three or four years ago the stock-owners in the Southern districts should have prepared for the disease by systematically inoculating their stock. It was simply because of their apathy that they were met to-day in conference.

Mr. R. WEEDON (Nerang): He was one of those who first had some cattle inoculated by the Department. Many people would not have it done, because they considered that when these cattle got ticks on them the ticks would produce redwater in any cattle that were not inoculated, and that was what frightened them. He thought it was about five years ago, and these cattle had been infested with ticks since, and did not seem to have given redwater to others, so it seemed as though the ticks off the inoculated cattle did not produce redwater. That had not been brought up in the discussion, and he thought it ought to be made public, for as long as people thought that redwater was caused by inoculated cattle they would not inoculate. He could only say that he had his own cattle done, and there was no loss by inoculation. There had been no loss from redwater since the ticks had come amongst them.

Mr CHARLES asked how long the cattle were inoculated before Mr. Weedon had ticks in his property?

Mr. WEEDON: Probably three years.

Mr. W. J. TUTIN (Bundaberg): They had had ticks in the Bundaberg district for a considerable time, but before the ticks arrived Mr. Pound was sent up and lectured on inoculation, and they inoculated the cattle before the ticks came, which, he thought, was the proper thing. It was the experience in his district that, if they delayed inoculating until the ticks arrived they would lose a large number. Some of the farmers had been afraid to inoculate; then they inoculated, and a lot of cattle died. Since then they had had a co-operative dip, and dipped every six weeks, and they had no trouble with redwater, but there were certain times when a stock-owner might have serious loss in his cattle, and it was attributed to redwater, although it might not be so. In his opinion, the Government ought to have a veterinary surgeon in the large centres, so that they would be able to tell what the cattle died from.

Mr. F. W. UHLMANN (Burpengarry): He remembered that it was about ten years since Mr. Pound first advised inoculation at Hemmant. He

mentioned that they had had half of a dairy herd inoculated—about 50 head—and 10 of them, which were springing, lost their calves. If that result would follow inoculation of dairy herds they could not have it done, because they could not afford to lose the calves. It was said that inoculation cured redwater. It was a funny thing that perhaps two in a paddock out of 100 got redwater and others did not. Inoculation had got into disuse, and they had not been advised to keep it going. They were told that dipping was the thing, but it did not seem to keep down redwater. It was advice which they wanted.

Mr. HEINEMANN (Mount Cotton): He endorsed the remarks in the paper of the Brookfield Association, and thought that that method, if followed up, would prevent a lot of trouble. He had followed up dipping since the Department put it in force five or six years ago, and spent money in getting rid of the ticks, but the great drawback was, that people with perhaps 10 or 12 head let them stray about your paddock and breed ticks. Redwater came into his district. Some men did all they could to keep their stock clean by dipping and keeping them in proper paddocks. A dairyman might keep his cattle clean, but when they associated with those of other people who did not dip, and whose cattle were worried to death by the ticks, they picked up the ticks and he lost them. He did not want to chance his herd, and he started washing them until he had a dip of his own, and he had not lost one yet. The dip had cost him £60, which he thought was money well spent. He had found that one dipping was sufficient, but he made it a practice to dip every three weeks or more as required, as sometimes ticks were more prevalent than at others. It was necessary in dipping cattle to pick a suitable part of the day. If they dipped in the morning, when there was a westerly wind, certain cows got chilled. With regard to redwater, he had had some experience about twenty years ago in his herd. He had put some three-year-old heifers into a paddock, where they appeared to be doing well, when 7 out of 24 died. He took the remainder of the cattle out of the paddock, and shifted them over the road to the next paddock, and there was no more trouble. He would like to hear some explanation as to the cause of death, but he put it down to "cunjeboi."

Mr. ALEX. SMITH (Esk) said there seemed to be an idea in his district that ticks had no connection whatever with redwater, but that redwater was a distinct disease, and that there was, therefore, no use in dipping cattle. He thought the disease was in his stock previous to his dipping regularly, and that it was only showing itself now, but he should like Mr. Pound to tell them how long the microbe was in the system before it became manifest. He thought the local authorities should take action in this matter, and appoint an inspector, who should have power to impound all cattle straying on roads and reserves. The roads and reserves were at present smothered with cattle, and it was impossible to find out who were the owners of those cattle. Until some definite action was taken in the direction he indicated they would not be able to stamp out the tick. He had been dipping his stock regularly, but one of his neighbours objected to dipping, as he believed that as soon as he started dipping he would begin to lose his cattle. The Government should make dipping compulsory, and see that it was carried out.

Mr. J. C. NEILSON (Forest Hill) related an experience he had with ticks three years ago. His neighbour was a cattle dealer, and he bought some bullocks in Brisbane, and put them in a paddock next to his. Some of those cattle strayed into his paddock. Those cattle were infested with ticks, and he got the owner to remove them immediately he found there were a number of ticks on his own cattle. They took off what ticks they could find on the beasts and burned them, but in a short time they became very numerous, and the cattle were quite infested with them. The boys picked a bucketful off one cow one day. He sent the cattle regularly every sixteen or eighteen days during the whole summer to be dipped. The first few times they were dipped

they were literally covered with ticks, but he kept on dipping them, and, after the fourth time, he could not find a trace of ticks, and he kept on dipping until the cold weather came on. It was now three years since he dipped a beast, and if he had taken any cattle into the saleyard, he never brought them home again. When cattle were to be dipped a favourable day should be chosen for that purpose, and they should not be over-driven to the dip, but should be taken as gently as possible, and not put through the dip while they were heated. After they had been dipped they should be allowed to go to their own paddock at their own pace. A hot day was a good day for dipping, provided they had plenty of shade for the cattle. He had seen his neighbours dip cattle at 4 o'clock in the afternoon, and the next morning the cattle suffered very much in consequence of being dipped so late in the day. He had noticed that cows in full milk did not lose any milk when they were dipped an hour or so after milking, but that if they were dipped later in the day there was a falling-off in their milk. He had also dipped cows just before calving, and they had not suffered any injury. Dipping should be made compulsory. Redwater might attack any herd the same as any other disease, but if it were not for the tick carrying the disease to other beasts the losses would be comparatively small. The matter should not be left to local authorities. There were men in his district who ran 200 head of cattle on the roads and reserves, and unless the cattle were impounded they could not find out who were the owners. He supposed the reason he had no ticks on his stock was because he had dipped his cattle, and had not taken any strange cattle into his herd.

Mr. N. WADE-BROWN (Gayndah): He really represented the dairyman's interest as well as the pastoralist's in the Upper Burnett district. His own experience was, that if you dipped too often you were bound to lose cattle. When the ticks first started he erected a dip, he used 1½ lb. of arsenic to 100 gallons of water, and next morning the cattle seemed fresh, and the ticks just as fresh as the cattle. There were only 200 head, and he put them through the dip the second time that morning, and let them out quietly into the shade. Next day several of them were lying dead. Some of them went into the river, in which their carcasses floated about. He thought they ran a risk in dipping rapidly, and that at least three weeks should elapse between the different dippings. On another occasion he was starting bullocks away to Baramba, and he was ordered to dip twice, which meant dipping once and then again in a week, and he begged and prayed to be relieved of such an expense and risk. He then wrote to the owners of the dip, and asked them to reduce the strength of the dip, but they did not like to do it, and the consequence was he lost 20 fine bullocks. They died of inflammation caused by the caustic soda, and it was a painful death. They suffered great agony, and would go into the water for relief. He had at first used 1½ lb. arsenic to 100 gallons, but latterly had been compelled by the regulations to use 2 lb. per 100. He had never thought that soda had more to do with the burning of the skin than the arsenic—that had not been his experience. Dipping would not prevent redwater; he was quite sure that 48 hours after dipping the ticks were on them again. With regard to ticks that were not killed immediately, he found as a rule that with 2 lb. of arsenic after three days they were lively. He had plucked these ticks off the cattle and put them in a box, and in course of time they withered and died, and did not lay their eggs. He was doubtful whether if they did not lay their eggs they became fertile, but that he had not proved. He could not say that he had any proof of the absolute immunity of cattle from tick fever. Dairy cattle were more susceptible to it, probably through being more delicate in constitution, and he had known a dairy cow to have tick fever three or four times, and to die the fourth time. That was not after inoculation; he only mentioned it as proof that they could get redwater more than once. He also believed in attenuated blood. If they got an animal which had

recovered from a bad attack of tick fever, and his blood was virulent and caused a high reaction, they would find if they kept that beast for six months and tried again the reaction would not be so high, and in another six months it would be lower still. That had been his experience. The ticks were in the district when he carried out the tests.

Mr. POUND: That is an explanation of how you got the indifferent reaction. The ticks will disseminate the disease afterwards.

Mr. WADE-BROWN: He was originally one of the movers to get Mr. Pound to give inoculation demonstrations in the North Coast, and out of 80 bulls inoculated at that time 35 died, which showed that the blood of the animal was pretty right. Mr. Pound said the conditions were wrong, because he drove them home three or four days at the rate of 6 miles a day, but he did not think that hurt them very much. His own experience was, that cattle did not feel the effects of inoculation for eight or ten days or a fortnight afterwards.

Mr. POUND: That is, the symptoms do not present their appearance. You must know that there was an incubation going on from the time those animals were inoculated.

Mr. WADE-BROWN: Mr. Pound had said at the time, "By all means drive them home, it will do them good, and you won't know that they are inoculated for the next ten days or a fortnight." One of the beasts that Mr. Pound had, he was good enough to leave with him. When this proved so fatal, he was frightened to inoculate cattle on a small property in the Port Curtis district. A man in that district had asked him for the loan of the bull, and had inoculated 100 of his cows, and he lost 10 per cent., and he knew how to inoculate; 12 per cent. of the cows were abortive in consequence of inoculation while they were in calf. Twelve months after a wave of tick fever came amongst them and took another 10 per cent., and he was in a bad way. Mr. Robert Barton had inoculated a lot of bulls on one of his properties, and put them in a paddock, and latterly had put in a number of uninoculated bullocks, and in three months the uninoculated bullocks were struck by a wave of tick fever. Of course there were ticks there. Some of them died, but none of the inoculated cattle died. Four months after that there was another wave of tick fever, and some of the old inoculated cattle died and some of the uninoculated, and some of those which had recovered from tick fever were seized with fever again and killed. That showed how conflicting opinions were in regard to inoculation and fever.

Mr. POUND: Was there any guarantee after Mr. Barton inoculated these animals that they reacted?

Mr. WADE-BROWN: He could not swear that they had reacted of tick fever.

Mr. POUND: These little instances condemned what he had proved to be a most successful system. There was one matter more particularly in reference to bulls. He admitted that mistakes had been made in the early days. But look what was done in the United States in reference to immunising cattle for the owners in permanent tick-infested districts. In Queensland they—particularly the Northern cattle owners—had to improve their herds, and must import cattle from colder climates; it was no use to buy cattle that were bred locally. The cattle going into those districts were susceptible, unless they were treated in some way. Many people in the United States had thought seriously of the trouble since 1868, when it became a serious matter in Texas, where from that year up to the introduction of inoculation cattle which were imported for the improvement of herds died in large numbers, and it became so serious that it was impossible to carry on the importation of stock. But what had happened in the United States simplified matters. They had experiment stations in each individual State, and the officials afforded the best information possible to stock-owners intending to purchase bulls and heifers for the improvement of their herds. They not only imparted information, but

they would look after anyone's cattle at these experiment stations, and inoculate them, and they gave a guarantee that 90 per cent. would be rendered immune. They inoculated them and saw that there was a reactionary fever, and only charged the owners fees for agistment. He was a Government official, and it was difficult for him to advocate it, but they wanted something on these lines here. There were individuals who purchased cattle, and who let him have charge of them, giving him a free hand in inoculating them before they went up North, and as in the case of Mr. Robert White's bulls, they had only been too pleased. That gentleman came to him the other day and mentioned that he had had no loss in connection with the 42 bulls which he (Mr. Pound) had inoculated some years ago, and wanted him to inoculate some more. This work must be done under proper supervision, and they must have a guarantee that the animals which had been inoculated reacted. Another case, opposite to that of Mr. White, was that of a Jersey bull which Mr. Archer got, which had to be inoculated three times. If that bull had gone away to the district he would have died from tick fever. This bull reacted a third time, and went away, and was now alive.

RESOLUTION.

Mr. N. WADE-BROWN (Gayndah): Notwithstanding what he had said about inoculation, his opinion was that the balance of evidence was in favour of inoculation. He had inoculated a good many of his own herd, and intended to inoculate other stock which had not been so treated up to the present time. He considered that it was important that they should have Government dips, as small settlers could not afford the expense of erecting dips on their own account. He moved—

> "That in the opinion of this Conference the local authorities in infested areas do not study the welfare of the stock-owners in the district in so far that, while they have the administrative power in their own hands, cattle are allowed to graze and run loose upon the public roads and reserves to the encouragement of the spread of ticks. Tick-infested cattle should be prevented from straying on public roads and reserves, and all such cattle so straying should be impounded by the inspector and dipped at the owners' expense."

Mr. R. WEEDON (Nerang) seconded the motion. The shire council in his district had for some time past been doing what was proposed in the resolution. Tick-infested cattle which were found straying were taken to the dip, and the owners were charged double dipping rates.

Mr. W. M. CHARLES (Maryborough) said the local authority in his district had to give seven days' notice before compelling owners of cattle to dip them.

Mr. ALFRED GORRIE (Brisbane) supported the motion. At the same time he thought there were a few inconsistencies in connection with this tick question. If they had their animals absolutely clean, and a wave of tick fever came along, they would probably suffer. He had tried as hard as any man in the country to keep his small herd of cattle clean, but some of them had gone down from redwater.

Mr. COLLINS: Are there any ticks at your place?

Mr. GORRIE: He could not say, but he knew that for the last three months his cattle had been clean. He did not say that the ticks did not convey the fever from one beast to another. Probably his animals were inoculated many months ago, but he should like to know whether the tick needed to be on an animal in order to give it fever. Dr. Lignières, who investigated the matter in the Argentine, maintained that the tick in the nymph form caused the fever. He (Mr. Gorrie) had carefully examined animals which had died, but could never find a tick on them, though he admitted that previously they had had ticks. He had dipped his cattle

until he came to the conclusion that the dips became a source of contamination. He held that if his animals were free from ticks, and he sent them along country where cattle with redwater travelled to be dipped, they might pick up a contaminated tick on the road, and for that reason he had not sent them to be dipped. One cow in calf which had died disclosed at a *post-mortem* examination disease of the spleen, and if the cow had recovered the calf would have died, as it was diseased round the navel cord. He could not dissociate tick fever from abortion in cows. If a cow had tick fever properly she would abort. He should like to know what difference there was between inoculation and tick fever, because his experience was, that if a cow got inoculation severe enough to become immune by one inoculation she would abort her calf, and the chances of her dying of tick fever were as great as if she took the fever itself. (Voices: "No, no.") He maintained that if a cow had a sufficiently strong fever through inoculation her chances of death were just as great as if she had taken the fever itself. Of course, Mr. Pound would say that they would not give a beast a 20-cubic-centimetre inoculation, but would gradually bring it up to a condition of immunity by low doses. But he held that if they inoculated up to a strength which would make animals immune the result was not different from that of the fever itself. They suffered a national loss when Mr. Pound was withdrawn from the work of investigating the tick trouble. There was one point on which he should like to have some information from Mr. Pound, and that was the origin of splenetic bacteria. They knew that the tick was an agent which would carry the disease, but he had never heard from Mr. Pound what was the origin of the bacteria. There had been many serious complaints in Denmark with regard to troubles arising from bacteria, which it was thought were going to destroy the dairying industry, but, having discovered the origin of the bacteria, they found an antidote for the disease. If we could discover the origin of splenetic bacteria we might be able to find an antidote for that disease.

The CHAIRMAN pointed out that the question of appointing a bacteriologist in connection with the Stock Department would come up for discussion at a later stage of the proceedings, and that would be a more convenient place to deal with the matter Mr. Gorrie was now discussing.

Mr. GORRIE said he had no desire to anticipate discussion of the subject, and was quite willing to defer the matter to a later stage. Another matter on which he should like some information was whether this disease was not one which would result in the survival of the fittest. He had attended the *post-mortem* examination of many animals which had died from tick fever or redwater, and he had never yet found one which was over six years old that had not some other disease. This suggested that it was probably the condition of health in which a cow was at the time which prevented it withstanding ticks and tick fever. In most of the cows that he had examined he had found tuberculosis in some form or another. He had examined some dozen cows, and in each case found traces of tuberculosis. Reverting again to inoculation, he wished to say that if it caused abortion in their herds that was a serious matter to contemplate. In ridding their herds of ticks they might be exposing them to a further danger in that the animals which had been mostly kept clean were those which were most affected with tick fever. That, at any rate, was the case on stations in the North.

Mr. ORR: One of the questions Mr. Gorrie had raised worried the Department for some time, and they wrote to Mr. Archer as far back as February last, as follows:—

"DEAR MR. ARCHER,—I am writing you in the hope that you will kindly advise me how you are faring in Gracemere with ticks and tick fever this season. We are having a number of fatalities in and around Brisbane, and stock-owners are at variance with regard to the benefits or otherwise of inoculation, whilst some are opposed to dipping milking cattle.

"I will be obliged if you will briefly advise me of your experience as to the value or otherwise of (1) dipping, and (2) inoculation."

He would just read Mr. Archer's letter in connection with inoculation with too strong blood, which was as follows:—

"I am still a strong believer in inoculation, and believe, after ten years' experience of ticks, that, until your country is really redwater country, when the calves will become naturally immune when dropped among redwater ticks, inoculation and dipping should go together. I think our knowledge of inoculation is still very imperfect, and that experiments should be carried out to try and standardise the blood of the bleeders. I found on one occasion when using six bleeders (yearling steers), that the blood of three of them produced very severe reaction, killing 20 to 25 per cent. of the cows we inoculated; with the other three the reaction was hardly noticeable, but although there were no deaths among the cows inoculated with their blood, these cattle were sufficiently protected to withstand without loss a second inoculation with blood from the first three bleeders which had produced such heavy reaction. Having thus in a way standardised the blood of the six bleeders, we inoculated all the Lonsdale stud cattle, first with mild, then with severe blood, and the herd, including 200 to 300 bulls, was well protected at a loss from inoculation and subsequent wave of redwater produced eighteen months after by the ticks of 5 to 6 per cent. This immunity from redwater was soon afterwards tested by travelling 40 bulls that had never seen a tick through 250 miles of redwater country, and delivering them on a run without loss, where the cattle were dying from the disease. These bulls were all alive and well twelve months after delivery.

"Were I in your place, I should strongly advocate inoculation as well as dipping, and try to provide the smaller owners with reliable blood, which will protect their cattle without killing a percentage of them. Unless reaction is proved by the taking of temperatures I always believe in a second or third inoculation."

The late Dr. Hunt had told him dozens of times that when you inoculate your cattle you should have a practical test with five or six steers. For instance, you had a beast which was known to have recovered from redwater. You get that animal, and before inoculating your herd with it find out if it has the power of disseminating the disease, and thus also find out the strength of the blood. If the blood proves to be too severe, don't use it. Get another beast, and some more steers, and find out whether the new blood sets up a slight reaction, and, if so, the severe blood could be used for the second inoculation. Where a great many make a mistake is, that they get a beast that has recovered from redwater, and inoculate their herd without taking notice whether there was any reaction or otherwise.

Mr. F. S. SCHOLLICK (Kilkivan): He did not think anyone who had experience of redwater could have the slightest doubt that inoculation was the remedy, but the great difficulty was in the small settlers getting reliable blood. Severe blood had been referred to. People in his district had been giving bulls only two centimetres, and then after a few weeks gave them a full dose, and there had been very few losses in those cases. The Department should either act according to Mr. Booker's paper, or else supply them with reliable blood. He thought there was a great deal to be said both for and against dipping, but to say they were going to wipe out ticks with it would be almost ridiculous. Ticks had been on St. Helena for a long time, and were still there, and if they could not keep that island clean, how could they keep the country clean when they had got into all the districts? They must inoculate for tick poverty. There were cases in his district where people who had kept their cattle the cleanest had suffered the heaviest. Some of the cattle which went through redwater five or six years ago had this year suffered as heavily as they did before, and they were the cattle of men who had dipped regularly every three weeks. His experience had been that he got cattle clean, and when the

germs of redwater got in the herd it was eight or ten days after dipping that the loss from redwater used to break out. If there was a germ in the blood, dipping would not cure it, but would accentuate the disease. If a man like Dr. Hunt were here to look into this matter it would do an enormous amount of good. With regard to giving drenches to cattle: There were some cattle which had had total immunity from redwater when cattle all round them had been dying, and in those paddocks it would be found there were mineral springs, which it seemed to him always acted as a tonic on the blood, and enabled it to resist the disease. He thought if there was some ingredient like sulphur in the dip it would save the cattle. He had been using sulphur with great success, but perhaps the chemist might be able to tell them of something better.

Mr. C. M. NOTHLING (Teutoberg): What we wanted was independent inspectors who would take care that tick-infested cattle were not allowed to camp on roads or reserves. They had had no redwater in his district until lately, when bullock teams in which the animals were infested with ticks came along the roads. As soon as they passed along the cattle belonging to the local residents were affected with redwater. The cattle were washed and the ticks disappeared, but the next time a bullock team came along they had ticks again. This kind of thing should be stopped by regulation or legislation.

AMENDMENT ON RESOLUTION.

Mr. ALEX. SMITH (Esk) moved as an amendment—

> "That this Conference is of opinion that the local bodies should be compelled to take action with regard to the impounding of stock off roads and reserves within their respective areas for the purpose of suppressing ticks."

No authority was more able to cope with this matter than the local body, as, in order to suppress ticks, it would be necessary for an inspector to go into every person's paddock as well as along the roads and on reserves to ensure that dipping was carried out.

Mr. THOS. HAMLYN (Crow's Nest) seconded the motion.

At this stage the Conference adjourned till 2.30 p.m.

AFTERNOON SESSION.

On the Conference reassembling after lunch—

The CHAIRMAN said: The motion before the Conference is the resolution by Mr. Wade-Brown, to which an amendment has been moved by Mr. Smith.

Mr. GRANT (Rosewood): As to the amendment, there could hardly be two opinions as to the shire councils being the proper people to take action in this matter, but he thought the shire councils had more than they could do to look after their roads without the supervision of the ticks, and unless substantially assisted by the Government it would be almost impossible for them to do so. To that end he suggested that the Government should subsidise the local authorities, so that they might be able to appoint an officer to continuously supervise the roads and look after straying cattle. The danger was from cattle straying on roads and reserves. They belonged to nobody, and it did not matter how clean you kept your country, it would be useless unless these straying cattle were kept off the roads. He suggested the insertion of a clause in the Act for the above purpose.

Mr. EATON WINKS (Harrisville): If he was in order, he wished to propose a further amendment on the amendment already moved, viz.:—

> "That in the opinion of this Conference it is considered inadvisable to place the compulsory dipping of cattle and impounding straying stock under the control of the local authorities, those bodies having already too many duties to attend to."

He considered that the Department already had power under their regulations to get over the difficulty. He was of opinion that the effect would be to destroy the good which had been attempted to be done if the local authorities had the matter in their hands.

Mr. J. T. W. McLaughlin (Mount Alford): He would second the amendment. He lived in the neighbouring shire to Mr. Winks, and considered that the divisional boards had no money left to attend to the matter. The stock inspector in their district was quite capable of attending to the matter. About twelve months ago that officer put an advertisement in the local papers notifying owners of stock straying on roads that they would be impounded on a certain date, but he did not go beyond that. If the matter was left to the shire councils it would be only half done, if it was done at all.

Mr. Tutin asked whether the amendment was in order, as it appeared to be a direct negative on the first amendment?

Mr. Charles said local bodies should carry the work out. In Wide Bay, which was a very extensive district, they had a capable inspector, but it was impossible for him to look after the whole unless he was helped by the local bodies. He belong to the Tiaro Shire Council, on which there were nine members, and he was certain if it was left to the shire they would do their utmost to clear their roads.

The Chairman did not think the amendment was in order, because it was bound up in the original motion and amendment. At present the local authorities had certain powers, and the idea was to alter them. Mr. Wade-Brown wanted to make it compulsory on the local authorities to take action, and if the voting went against him the amendment was not necessary.

Mr. Bates (Biggenden) thought the amendment rather strict as to impounding stock on reserves or roads. In his district they were short of water, and many selectors had to turn cattle on to the roads. He only referred to clean cattle.

Mr. Wade-Brown said that cattle could stroll on reserves if they were not tick infested.

Mr. Bates said he was referring to the second amendment.

Amendment.—"That this Conference is of the opinion that the local authorities should be compelled to take action with regard to impounding tick-infested stock off roads and reserves within their respective areas for the purpose of suppressing ticks."—Put, and negatived; 3 voting for and 17 against.

Mr. Heinemann said with regard to small cattle owners he would be in favour of the motion, but he wanted to know whether the cattle kept clean would be exempted, or would all cattle be impounded. If it only concerned tick country, he would understand it.

Original Motion.—"That in the opinion of this Conference the local authorities in infested areas do not study the welfare of the stock-owners in the district, in so far that while they have the administrative power in their own hands cattle are allowed to graze and run loose upon the public roads and reserves to the encouragement of the spread of ticks. Tick-infested cattle should be prevented from straying on public roads and reserves, and all such cattle so straying should be impounded by the inspector and dipped at the owners' expense."—Put; 33 voting for and 1 against.

Resolved in the affirmative.

Mr. R. Weedon (Esk) asked Mr. Pound if ticks got upon cattle which had been inoculated, would those ticks or their progeny produce redwater on other cattle

Mr. Pound: Yes; that is a fact.

Mr. W. M. Charles (Maryborough): In New South Wales they had what was called coastal redwater. It was a totally different thing from Texas fever. There was no rise in temperature in this coastal fever, and he thought that

was what Mr. Moon referred to when he said there was a danger of ticks carrying redwater. He should like to hear Mr. Pound's opinion on the matter.

Mr. POUND replied that he should like Mr. Tucker to express his views on this matter, and tell them what this affection, which had nothing whatever to do with Texas fever, was caused by.

Mr. TUCKER (Veterinary Inspector): The disease which existed in Europe and other countries, and which was called redwater, had been ascribed to different causes. Many persons said it was due to poisonous plants of various kinds. Sometimes it arose from congestion or inflammation of the kidneys or bladder, and sometimes from the presence of stone in the kidneys or the bladder. It also occurred in connection with other diseases, and was supposed to be one of the symptoms of anthrax and some other infectious diseases. The old writers on the subject of redwater amongst cattle in England and Europe mentioned it as occurring chiefly on moors, in woody districts, and in swampy places, all of which would supply an excellent breeding ground for ticks. In England and throughout Europe wherever the disease had during recent years been scientifically investigated, it was found to be very similar to the disease that existed in Queensland. In fact, recent researches had shown that in the outbreaks investigated it was due to the *Piroplasma bigeminum* conveyed from one animal to another by means of ticks.

Mr. H. R. LASSIG (Bundaberg): Mr. Pound had said that calves up to the branding age should be inoculated in order to render them immune, and Mr. Archer, of Gracemere, stated in his paper that calves were practically immune from birth, provided the mother was immune. If the calf was immune from birth, what necessity was there to inoculate it? For seven years he held a selection on the Burnett. He bought some cows from one station which were tick-infested, and another lot from Thompson's Station which were practically clean and never had a tick. He put the second lot in a paddock with the others cows, but, on finding that they had ticks, he removed them to another paddock. Despite this precaution, however, fourteen days after their removal several of the cows died from redwater. With regard to the inoculation of cattle for pleurisy, he was told that the virus used was not strong enough, and that cattle had frequently to be reinoculated.

Mr. POUND referred to a previous report, and stated that the disease was not transmitted from mother to offspring. When the calf was born it had to acquire immunity in the tick-infested districts by getting tick-infested. If a district was free from ticks, and had remained so for many years, the calves must be inoculated if there was an apprehension of ticks making their appearance there, but if there were fever ticks in the district they did the work of inoculation.

Mr. GORRIE: Mr. Pound said the disease was not transmitted from the mother to the calf. He would like to know precisely what he meant by that, because he knew that the calf which a cow carried became diseased, and was often the cause of the cow aborting. He did not know whether Mr. Pound meant to imply that the cow did not affect the calf she was carrying in any way.

Mr. POUND: Had they any information which would show that calf did not possess tick fever in its system That was the question. These things must be settled in a scientific manner. There was a heifer in calf at Mundoolan which they took blood from. The blood of this calf *in utero* contained no organisms whatever—it was non-infected blood—wheras the blood in the mother was capable of setting up tick fever. That observation had been borne out over and over again in different parts of the world where these investigations were carried out.

Mr. GORRIE: In any cows which he had examined which had been in calf, he had always found that the navel cord was partly decomposed in the cow's udder.

Mr. POUND: Of course the fœtal calf may have died some time prior to the death of the mother.

Mr. WADE-BROWN asked Mr. Pound whether he believed that horses could carry the cattle tick and convey them to cattle. His own experience was this: Some years ago when the country between Gin Gin and other places was very thickly infested with ticks and tick fever, horses were brought over, ridden and driven, in great numbers to the town of Gayndah, but although there were cattle about the streets and in the vicinity of the town, the ticks never appeared on them till four years after, on the encroachment of the tick southwards. Although the horses were loaded with ticks, not a beast in Gayndah got them, have to bring horses in, and make it compulsory for them to be dipped. He had known one case out of several thousands where a cattle tick had developed on a horse to its full size. They were so diminutive that it was impossible to see them. They would not let horses go through New South Wales without dipping, but he believed there was no danger.

Mr. H. R. LASSIG (Bundaberg) said he could bring along several horses that would mature ticks. Sometimes a horse would mature a tick in the ear and in other soft places. If they were going to have tick reserves, they would have to bring horses in, and make it compulsory for them to be dipped. He had ridden a horse 35 miles and then found that it had no less than five matured ticks on it. If they did not dip their horses they would never get their country clean.

Mr. POUND: On many occasions he had found ticks matured on horses. They had laid eggs, and these eggs were fertile, and the larvæ had matured. Cattle ticks would develop on the natural host—that is, the bullock or cow—but they would also mature on horses or sheep. In our museum there were portions of the mouths of sheep, and also the ears, with ticks in various stages of development, and it was the same on horses and other animals. In the report from the United States it was mentioned that ticks had hatched on these unnatural hosts, but that after a time these ticks lost their virulency.

Mr. F. W. UHLMANN (Burpengary) said that this time last year he was on this side of Gladstone, and the horses there were covered with ticks. After they had come in, in a couple of months they were just like tick-infested cows. He believed horses which were not worked should be dipped as much as cows. Some people thought because their horses perspired a little the ticks died.

Mr. J. C. NEILSON (Forest Hill) thought horses should have been included in the motion which had been carried, as straying horses on the road. He had had to dip his horses as well as his cows for a whole season. The horses were sore in the collar from ticks biting them. If they made it compulsory to have straying cattle dipped it was equally necessary to have straying horses dipped.

Mr. HEINEMANN endorsed the remarks of the last speaker. If they wanted their horses to keep in condition they should be put through the dip occasionally, as they would be more contented; otherwise they were continually rubbing themselves. You could not see the ticks on them with the naked eye; they carried as many ticks as cattle, but only one or two of them matured.

Mr. LASSIG was always under the impression that ticks matured on horses; but they must accept Mr. Pound's opinion, as he had had experience, to the effect that if they matured on a horse they would not do any harm.

Mr. POUND said the point he drew attention to was that in an experiment they showed that fever was transmitted, and that had been the experience in other places. Horses were an unnatural host, and, in consequence, the ticks gradually lost their virulence. A tick coming from a fevered animal did not transmit it to a healthy animal. A tick after leaving an animal was incapable of hatching on a fresh enemy. Disease was transmitted in this way: The ticks matured on an infected animal and released their hold and fell on the ground. They commenced to lay eggs, which matured in due course, and the new ticks get on to fresh cattle. Ticks matured in the first instance on an infected

animal while it was taking blood for its nourishment, which had to be converted into eggs. Tick fever germs were also transmitted from the mother tick to the young tick.

COMPULSORY INOCULATION.

Mr. H. FREDERICKS (Marburg): His mind was quite in the direction that the calf was not born immune. If the tick imbibed the poison from the mother tick, how much more the calf from the mother? They wanted to find a remedy for this disease, and that remedy was inoculation and dipping. It appeared to him the consensus of opinion was in favour of inoculation. But, as had been pointed out, they might transmit worse diseases by inoculation, and the greatest care should be taken that they were supplied with the proper virus. His cattle at Marburg were inoculated twelve years ago, and he had not a single tick on them, although his neighbours had them. He travelled milking cows for about half an hour every morning along the public road, which was full of ticks, and yet he had not got them. At Rosewood, where he had ticks in his yard, he dipped the cattle regularly, and redwater had not appeared amongst them. At Mudgeeraba, he had not had any sign of redwater. He had some on agistment, on the other hand, at Hope Island, with Mr. Grimes, three of which had died, and he had removed the others. Mr. Grimes, who had lost a considerable number of his cattle, said they were always dying after the excitement of the dipping. Those which he removed had all recovered. In order to provide a remedy, he moved—"That inoculation be made compulsory in tick-infested districts." If we had compulsory inoculation as well as dipping throughout Queensland, virus should be supplied, if possible, from the Stock Department.

Mr. J. WITTMANN (Nanango) said that in the Nanango district they had scarcely any ticks, but he had found ticks on his cattle. He fed the cattle on paspalum grass, and three weeks ago, after they had been there for fourteen days, he found ticks on them. The ticks were so small that he had to put on his spectacles in order to see them. His cows had redwater the next day, and five of them died. His wife drenched the cows, giving about six packets of salts and a little saltpetre to each, and in time the cows recovered. One of the cows slipped her calf, and in one which died he found bloody matter in the bladder, the passage swollen, and the kidneys very much enlarged. They picked the ticks off every day, spending the whole time from 7 o'clock in the morning till noon going over thirty cows. What he desired to know was how to get rid of the ticks, and how to prevent sickness in the cows, and he thought the Government should assist stock-owners in this matter, seeing that not only they but the whole community would be benefited by the discovery of a remedy for their present troubles. We had spent a lot of money on tick inspectors, and yet the ticks had spread all the time. He thought dips should be erected by the Government, and that every person should be allowed to dip his cattle free of charge.

Mr. KELLY (Yandina) seconded the amendment, affirming that inoculation should be made compulsory. At the same time, he should not like to see hardship inflicted upon people by enforcing inoculation in places where there were no ticks and not likely to be any for some years to come. Those districts which were infected should be first dealt with, and the Stock Department should adopt some scheme which would ensure a supply of reliable blood which would not cause some foreign disease. At present, people took blood from a beast simply because they knew that it had been very sick from fever, but they had no guarantee that the animal was free from other troubles. We should have a stock bureau, and it should supply blood to stock-owners. One beast in a district, if taken care of, would serve the purposes of six or eight stock-owners, and after a time the chances were that each man would have sufficient blood from his own beasts with which to inoculate. He began inoculating in 1893, when his neighbours' stock were dying around him, and he could assure them

that the losses on that occasion were very slight. After that he was able to do the inoculating himself from a beast which gave reliable blood. At the commencement of this year some cows which had not been inoculated died from redwater, and he then took up inoculation again, but he could not guarantee that the blood he used was genuine. On the first occasion the losses from inoculation were 2 per cent., and on the second and third occasions there were no losses, although he had good reactions, the temperature in one case rising to 107·9 degs., and in several others to 107·6 degs., and it continued at that height for from thirty to fifty hours. The cows were about twelve years old. Unless inoculation was made compulsory, men would wait and wait through their fear of losing a drop of milk until redwater got into their herds. With inoculation, if the blood was genuine, 6 or 7 per cent. would cover the losses.

Mr. Winks (Harrisville) opposed the resolution, as it would be hard upon the small stock-owner. He failed to see that the meeting had proved dipping to be ineffectual, and his experience had covered a fair period. He was at Rockhampton for six years, and then came to Mount Flinders. They had a dip there, and last year had a severe attack of redwater. Before that, when there were any ticks seen, they had mustered the cattle and dipped them, and after the attack they dipped them every three weeks, and they had not had any loss for twelve months. He was convinced that if small owners dipped regularly they could keep their country clean and prevent the spread of redwater. The difficulty was that a man next door with only a few cattle might not dip at all. The prevalence of ticks in the Fassifern district was owing to dipping not being carried out regularly, and it accounted for the redwater there to-day. It would be a hardship if small owners were compelled to inoculate. It was quite open to those who thought inoculation was good to do it, but to force it down the throats of other people would be a great hardship.

Mr. Heinemann endorsed the opinion of the last speaker, and thought inoculation should be optional. If dipping was found not to be sufficient, it would then be the proper time to enforce inoculation.

Mr. H. J. Eichenloff (Wellington Point) was opposed to compulsory inoculation. Ten years ago he had inoculated his herd, and lost nine out of forty; that was long before the ticks came there. There was a dip erected by Mr. Burnett, and all those who dipped saved their cattle. It was the one-cow men who brought on the disease, as they only started to wash when the ticks got bad. At first, some would wash instead of dipping, but their losses forced then to dip, and since they had dipped there had been no redwater in the district. He had never had redwater, because he had kept on dipping. The dairy farmer had half of his cattle coming on every month, and he would have a great loss with inoculation, as it had been proved that when cattle were heavy in calf they would die.

Mr. Charles (Maryborough) supported the amendment. He came to settle three years ago at Coochin, in the Wide Bay district, which was considered one of the worst infested areas. He first built a dip. Then he brought cattle from New South Wales, and, by continual dipping, he had lost nothing. They could thoroughly clean their country by dipping every three weeks, but in Queensland nine men out of every ten waited till they saw ticks on their cattle before they dipped. Mr. Booker, of Woolooga, Mr. Smith, of Mount Joseph, and others who dipped, never had a case of redwater.

Mr. Edward Pike (Brooyar) said that dead carcasses on Woolooga and on his own selection proved differently. They had had redwater very badly there.

Mr. Charles asked why he did not get it? He had had five cases of redwater owing to carelessness. There was a sale held at Goochy by Lindley and Co., and they brought strange ticks there. He was absent in New South Wales, and his calves were left neglected. There were two deaths, and three recovered.

Mr. H. R. LASSIG (Bundaberg) said he was a butcher, and he thought butchers knew more about the results of inoculation than the men who inoculated. When the ticks came along, they dared not purchase any cattle which were not inoculated, and bring them into tick-infested country, as they would get redwater, but inoculated cattle did not get redwater. Although he intended to oppose the proposal to make inoculation compulsory, yet he thought inoculation was a preventive against redwater.

ANOTHER AMENDMENT.

Mr. E. WINKS (Harrisville) moved as a further amendment—

"That dipping only be made compulsory."

Mr. W. J. TUTIN (Bundaberg) expressed the opinion that after country was infested with ticks inoculation was of little or no value, because the ticks would have inoculated the cattle.

Mr. C. J. POUND said he would read them an extract from a report on "Texas Fever (otherwise known as tick fever, splenetic fever, or southern cattle fever), with Methods for its Prevention." The report was written by Dr. John R. Mohler, Chief of the Pathological Division, Bureau of Animal Industry in the United States. Dr. Mohler said:—"The inoculation always results in a more or less serious attack of Texas fever. Besides having a fever, there is a great diminution of red blood corpuscles, and in about 3 per cent. of the cases a fatal termination; but the proportion of deaths resulting from the inoculation is small when compared with the fatalities among untreated animals taken into infected districts. To this number should be added those animals (less than 7 per cent.) that do not receive sufficient immunity by this method, and which succumb when exposed to infested pastures. Combining these failures, it will be seen that, by this method of immunisation, instead of a loss of 90 per cent. among breeding stock taken south more than 90 per cent. can be saved." The statement there was that if they inoculated their cattle they would save 90 per cent., and this saving could not be effected under any other system of prevention.

Mr. J. HAYGARTH (Boonah) rose to a point of order, and asked if it was competent for anyone who was not a delegate to propose a motion.

Mr. W. M. CHARLES (Maryborough) seconded the amendment.

The CHAIRMAN: The amendment was proposed by a delegate. No one but a delegate can propose a motion or amendment, and no one but a delegate can speak at this Conference, except with the permission of the Conference.

Mr. E. PIKE (Brooyar) wished to know if the mover of the amendment meant by compulsory dipping that an inspector might dip cattle three times in one week if he thought it necessary to do so. He thought there should be some limit as to the length of time which should elapse between dippings.

Mr. E. WINKS (Harrisville) thought that a matter of that kind was a detail which should be left in the hands of the inspector.

Mr. W. SUTTON (Oakey Creek) said he had dipped his cattle every twenty-one days until the beginning of the present year, when he heard that his neighbours had redwater. He then started to dip every eighteen days, and he was one of the biggest losers of cattle in the district. He should, therefore, very much like to see inoculation, because gentlemen present, who knew more about the matter than he did, said they should inoculate. He would not force everyone to inoculate, but he should like to see the Department assist those who were willing to inoculate their cattle.

Mr. W. M. CHARLES (Maryborough) would like to know from the gentleman if he had ticks on his property.

Mr. SUTTON: Yes.

Mr. W. M. CHARLES: Well, if he had ticks, he was bound to have redwater.

Mr. W. J. HAWKINS (Bald Hills) said that he and several of his neighbours had dipped their cattle constantly for the last three or four years. He had dipped them regularly every fortnight for the last six months until three weeks ago, and exactly a week after he last dipped them tick fever attacked the cattle. He did not see how dipping was going to prevent redwater. He believed that, in order to prevent redwater, they would have to dip every three or four days. He favoured the Government taking some steps towards carrying out inoculation and establishing centres where good blood would be supplied, so that those persons who wished to inoculate their cattle should be able to do so.

Mr. UHLMANN asked Mr. Pound whether inoculation was the only cure that he could guarantee.

Mr. POUND: You misunderstand; it is not a cure, it is a preventive.

Mr. UHLMANN wanted to tell his association if inoculation was what Mr. Pound recommended, so that they could stop buying the stuff they had been using. They might as well have put sand down their neck. He was sent to the Conference in order to get a cure. If inoculation was the only preventive let them say so, and the people would know. All the curative preparations seemed to be money wasted.

The CHAIRMAN: The inoculation motion, and Mr. Winks's amendment that dipping be made compulsory, were separate matters. He would suggest that they vote on the original motion, and if that was negatived, they would take Mr. Winks's amendment.

Mr. TUTIN (Bundaberg) said if they were taken as separate motions he wished to move an amendment to the first motion.

Mr. CHARLES said there was really no amendment to the motion, and to test the feeling of the meeting he would move that inoculation be not compulsory.

Mr. ORR: If Mr. Frederich's motion was negatived, it rubbed the whole thing out, and inoculation would not become compulsory.

Mr. TUTIN wished to move as an amendment that inoculation be made compulsory in non-infested districts. That was the only place where inoculation could be of any benefit. (Laughter.)

Mr. J. L. FREDERICH'S motion—"That inoculation be made compulsory in tick-infested districts"—put, and negatived by a large majority, only 7 voting for it.

On Mr. WINKS' motion—"That in the opinion of this Conference dipping should be made compulsory in all tick-infested districts"—

Mr. JAMES SCANLAN (Flagstone Creek) said he lived in a district declared by the Department to be tick-infested, but there were no ticks nearer than five or six miles, and he asked if they would be bound by the motion.

Mr. ORR: No; this refers to tick-infested stock, not to stock in a quarantined area.

Mr. JAMES HORNE (Hopetoun) asked the Stock Department, through the Chairman, whether that was not compulsory now?

Mr. ORR: Yes, it was now. The motion was unnecessary.

Mr. HORNE understood that a neighbour carrying tick-infested cattle in his paddock had to report to the stock inspector, and they could write asking him to dip at once, otherwise an inspector could be sent up, and the man could be proceeded against.

Mr. ORR said when the Local Authorities Act was being framed in 1902 a deputation from the local authorities waited on the then Minister for Agriculture, Mr. Dalrymple, and asked as there were not enough stock inspectors, if there would be any objection on the part of the Stock Department to allow certain provisions to be included in the Bill giving local authorities power to

clean up their own district. Then, if the inspector came down and found cattle dirty, he could order them to be dipped, and if he could not come, the local authorities could order them to be dipped, so that between the two they would be bound to be dipped. Sections 157 of the Act enabled local authorities to proclaim the tick a pest, and section 158 gave power to make by-laws for the destruction of the ticks. That was the law, and if the meeting passed a resolution recommending that compulsory dipping be enforced by the local authorities and the Stock Department they would achieve what Mr. Winks wanted. If a recommendation went from the Conference that compulsory dipping should be gone on with, that would really end the matter, but to pass a resolution that they should have power to have compulsory dipping was of no avail, because they had it now.

Mr. F. S. SCHOLLICK (Kilkivan) said if they were compelled to keep their young stock clean they would not get them immune. The ticks themselves made the young stock immune, and if you did not allow the ticks to get on them the young stock would remain unimmune.

Mr. N. WADE-BROWN (Gayndah) said his experience was that they must "tick up" occasionally—(laughter)—in order to keep their cattle clean. In many instances he drafted the calves out, and did not dip them with the cattle, and quite a lot of those calves were absolutely immune; the ticks had made them immune.

Mr. E. WINKS (Harrisville): The general opinion seemed to be that if his motion were altered to read that the present law in regard to dipping should be enforced, that would meet the case.

Motion.—"That in the opinion of this Conference dipping should be made compulsory in all tick-infested districts"—put; and carried with only one dissentient.

NECESSITY FOR ISOLATING CATTLE INFECTED WITH REDWATER—DOES DIPPING PREVENT REDWATER?

These subjects were suggested for discussion by the Teutoberg Farmers' Association.

The CHAIRMAN asked Mr. Nothling, the delegate from that association, if in view of the discussion which had already taken place he wished to have these matters further considered

Mr. C. M. NOTHLING (Teutoberg) replied that the experience with regard to isolation in his district was satisfactory. They had proved that if they had only a chain road between tick or redwater infested country and non-infested country clean cattle were not affected.

Mr. W. J. TUTIN (Bundaberg) said his experience was that they could have redwater in one paddock and the next paddock be perfectly free from the disease.

Mr. EICHENLOFF (Wellington Point): The Wellington Point Association had asked him to inquire whether any ticks had been found on clean cattle running with infested cattle. Two members of the Association had one cow running with tick-infested cattle, and she had never had a tick on her.

Mr. C. J. POUND thought that if he saw that cow he would satisfy the owners that there were ticks on her. At the same time he might say that it was quite possible to find some one animal which was not only immune to tick fever, but also to tick infestation.

Mr. MORRIS (Brisbane) asked how long was it necessary to isolate cattle after an outbreak of tick fever before it would be safe to bring clean cattle into a tick-infested district?

Mr. C. J. POUND replied they could not guarantee that a beast was free from infection under twelve months.

NATURE AND CAUSE OF TICK FEVER OR REDWATER—CURE AND PREVENTIVE TREATMENT OF THE DISEASE—THE MOST EFFECTIVE MEANS OF CHECKING THE PEST.

These subjects were suggested by the Hopetoun Pastoral, Agricultural, and Progressive Association.

Mr. J. HORNE (Hopetoun) said these matters had been pretty well threshed out in the Conference, and he would only add that he thought the Government should re-establish the Stock Institute. As far as he could gather, dipping minimised the danger from ticks, but did not do away with it. What they should do was to proceed on the lines of inoculation, the department helping stock-owners as far as possible with advice and a supply of reliable blood. He moved—"That this Conference is of opinion that the Government should re-establish the Stock Institute."

The motion was not seconded.

Mr. C. J. POUND pointed out that dipping had its distinct advantages, but would not prevent the spread of the disease. In the prevention of disease it was most useful in combination with inoculation.

Mr. J. SCANLAN (Flagstone Creek) asked which was the best time for inoculation—when the ticks were active or in winter?

Mr. POUND said there was a lot of repetition in the answers he had to make. The one thing to consider was the condition or environment in which the animals had to be placed—they must have good food and plenty of fresh water. These conditions were now just beginning to disappear; in the winter months they had not the green feed. The spring of the year, or just after the commencement of the wet season, was the most favourable time. He would like to read a few lines on "The Cure and Preventive Treatment of the Disease," from a treatise by Dr. Mohler, published at Washington, U.S.A. Dr. Mohler said:—

"Medical treatment of the sick has generally been unsatisfactory, although in chronic cases and those occurring late in the fall beneficial results have followed. If the animal is constipated, a drench containing 1 lb. of Epsom salts dissolved in 1 quart of water should be administered, followed by the sulphate of quinine in doses of 30 to 90 grains, according to the size of the animal, four times a day until the system is well saturated with it. Tincture of digitalis ½-oz., and whisky or alcohol 2 oz., may be combined with the quinine, according to indications of individual cases. An iron tonic containing reduced iron 2 oz., powdered gentian 4 oz., powdered nux vomica 2 oz., powdered rhubarb 2 oz., and potassium nitrate 6 oz., will be found beneficial in the convalescent stage when the fever has run its course. This tonic should be given in heaping tablespoonful doses three times a day in the food. Good nursing is essential in treating these cases. The animal should be given a nutritious laxative diet, with plenty of clean and cool drinking water, and allowed to rest in a quiet place.

"If the stable or pasture is infested with ticks, the animal should be placed in a tick-free enclosure, to prevent additional infestation with these parasites and the introduction of fresh infection into the blood. It is advisable, not only before but also during treatment, to remove from the sick cattle all ticks that can be seen, as they keep weakening the animal by withdrawing a considerable quantity of blood, and thereby retard recovery."

Mr. W. A. A. BATES (Biggenden) had had much experience, and could safely say that inoculation was a preventive. He had inoculated a few thousand cattle, and those which he had inoculated were alive, but the uninoculated ones had died. He could not say as to dipping. If the Department supplied them with tested blood he believed they would all take the matter up. Owing to the drought, cattle had appeared to be immune, but the disease

was now breaking out again. If he could get good blood he would not mind buying two or three head to take back with him for use by himself and neighbours, as he thought it was the best thing they could do.

Mr. WEEDON (Nerang) spoke on behalf of the little man, and not large cattle-owners. He believed there were two different sorts of redwater. Before the cow was sick she dropped in her milk. As soon as they saw that they should give her from ½-lb. to 1 lb. of salts, according to the size of the animal, and if she became worse, two days afterwards give her the same amount again. No cow which he had seen treated in time had died. But if they left them and sent for some quack or other, by that time the cow was cooked, and a bucket of salts would not cure her. Some had been given saltpetre, but his experience was that it was a mistake to give saltpetre.

Mr. ORR: Following up Mr. Weedon's remarks, he might mention that Mr. Cory, the late Goverment Veterinary Surgeon, stated emphatically that people had called at the office to say that they had cured their cattle by this method, but that had been when action was taken immediately. When the cows had been milked the attentive dairymen watched them very closely to find out whether there was a rise in the temperature, and the minute there was a rise the salts were applied. But if they waited till the cow had developed the fever before giving the salts, they were only irritating instead of curing the animal.

Mr. KELLY (Yandina) said a gentleman in his district had been in the habit the last three months since redwater broke out of drenching his cows with salts, quinine, &c., but he had lost several.

Mr. UHLMANN said that some cows would go off the day they were attacked, and die; others would lie down. The moment his own cows lay down there was no hope for them. He had used Mr. Cory's prescription, and watched them carefully. Some got well, and others died, but there was no sure cure. The most successful medicine he used was some powder he got from Mr. Irving. Five or six of them took it in turns to watch their temperature, and as soon as it went up a point they gave them the dose. Forty cows got well, but they lost about 80 cows and heifers in four months. Most of them were springers, and the funny thing was that nearly all the first calved (40 or 50) and they only lost two out of them—some got over it without dosing. Most of them were aged cows and heifers in calf, and the fatter they were the quicker they went off.

Mr. ALEX. SMITH (Esk) said the redwater cure which he found most effective was a pint of linseed oil. He tried the salts and did not care about them, as they were rather too stringent, and he did not care for saltpetre. The man he had running the dairy tried the oil with the best results. In every case, after giving them the dose, they would slip the calf.

Mr. BRÜNNICH said the treatments which had been mentioned—inoculation and dipping—were more or less remedies. Even in America they were not satisfied that any of these things were absolute cures. In America, they were trying now to give something to the cow internally, which would entirely keep the ticks off, or make them fall off, and some experiments ought to be made in this direction. He might say that at Biggenden there was a paddock, in which the ticks dropped off the cows, and it was said it was probably through the mineralised water there. We ought not to be satisfied with these two remedies, but try to find out something to prevent the ticks getting into the cattle. They knew quite well dipping did not prevent ticks coming back to the cattle. It might be possible to change the formula of the dip, so that it remained longer on the hide, but it was doubtful whether it could be done without injury to the animal. It was not at all impossible that some chemical or medicine might be discovered which would keep off ticks from them. The Stock Department might try to find such remedies.

TICKS AND TICK FEVER.

This subject was suggested by the Port Curtis Agricultural, Pastoral, and Mining Association.

Mr. J. Henderson (Gladstone), who represented the association, said he could not add much to what had already been said on this matter. When the ticks came to the Rockhampton district in 1896, they were advised to inoculate their cattle. From the Stock Department he got one of the best apparatus procurable, and found it very effective. At first there was very little reaction from the inoculation, but later on the reaction was quite strong. Shortly after that, ticks became so numerous on the run with which he was connected that the cattle were badly infested. That was twelve or eighteen months before redwater appeared. The first cattle that died from redwater were cattle which were missed in inoculating. He inoculated the cattle a second and third time, and from that time the cattle became immune, and for the last two years he had not seen any beast affected with the disease. His advice was to inoculate all cattle under two years old, to dip milking cows, and keep them clean, but not too clean—leave a few ticks on them, which would gradually produce immunity. All stock travelling to market should be dipped a week before starting, and then every three weeks while on the road.

BACTERIOLOGIST FOR THE STOCK DEPARTMENT.

This proposal was made by the Wide Bay and Burnett Pastoral and Agricultural Society.

Mr. W. M. Charles (Maryborough) thought this was one of the most important matters that had come before the Conference. When they lost Mr. Pound from the Stock Department, and he was taken to the Health Department, stock-owners suffered a great loss. What did they know about ticks? There was such a diversity of opinion among them on the subject that they could not arrive at any satisfactory conclusion. They wanted a bacteriologist to be attached to the Department, and he desired to see Mr. Pound appointed, or reappointed, to that position. He should like to inoculate his cattle, because people wrote to him, and asked him if he had any bulls for sale, and if they had been inoculated. He had to reply, "No; but they are clean." He should like to be able to send to the Department and get properly tested blood with which to inoculate his cattle, and he should like to see experimental stations established in each district, under the supervision of Mr. Pound. He moved—

> "That a bacteriologist be attached to the Department of Agriculture and Stock, whose duty shall be the investigation of diseases in stock."

Mr. Alfred Gorrie (Brisbane) seconded the motion. When Mr. Pound left the Department of Stock the cattle industry was left, as far as diseases in stock were concerned, like a ship without a captain. As far back as 1893, "His Excellency the Governor, with the advice of the Executive Council, was pleased to direct that a Stock Institute be established in Brisbane, having for its object the discovery by means of experiment and research the nature and origin of diseases in stock and the means of their prevention," and Mr. C. J. Pound was appointed in charge of the institute. He should like to know what had become of that Stock Institute, and they had no bacteriologist in connection with it. The health of the community had certainly the first call upon the Government, but the dairying industry was now of such importance that in the interest of the whole community they should have the services of a bacteriologist made available for the investigation of diseases in cattle. Until Mr. Pound resumed the work which he was doing some years ago, they would not be able to do much in the way of devising practical measures for the eradication of diseases in stock.

Mr. R. Weedon (Nerang) agreed that the Government should assist stock-owners in the manner proposed in the resolution. Mr. Charles had asked what

did they know about ticks? Well, some of them did know a thing or two about ticks. The tick was a parasite. He would tell them where the tick came from. The tick was a parasite of the buffalo, and the buffalo was brought into the Northern Territory. When any animal became poor in condition, it became infested with parasites. Let pigs get poor, and they would get pig lice on them. Even human beings had their parasites, which became manifest when the body was in a poor condition. The tick was the natural parasite of the buffalo, and from buffalos it got on to cattle. When people were closely congregated together and did not take proper sanitary measures, the plague was sent to remind them of their obligations to observe the laws of health. This country originally had only a few kangaroos on it. Then human beings came and put too many cattle on it. Nature said she must thin out those cattle, and tried pleuro, but that did not do, and now she was sending ticks and redwater, and the result would be the survival of the fittest. (Laughter.)

Motion put and agreed to without dissent.

GRANTING OF SUBSIDY TO PRIVATE DIPS IF OPEN TO THE PUBLIC.

Mr. C. M. NOTHLING (Teutoberg), the representative of the Teutoberg Farmers' Association which suggested this measure, said it would be a great advantage to stock-owners who had to travel their stock long distances if private dips were open to the public, and to this end he thought it desirable that the Government should subsidise private dips. He should like to hear the opinions of other delegates on the subject.

Mr. WADE-BROWN: In his district all private dips were open to the public, if they liked to come and pay. He did not think that any of the owners refused to let the people dip. His own dip was used pretty constantly by other people. It was unlikely that the Government would subsidise them.

Mr. UHLMANN (Burpengarry) pointed out that there were some who had a dip in a corner of the district by themselves, and perhaps had not the privilege of putting other cattle through besides his own, but he would have been put to the same expense. So that the Government would really have to subsidise all private dips.

Mr. TUTIN thought that dipping would be the best paying business in the State at 3d. a head. At his own dip they dipped for anyone who came along at 1½d. a head, and it left a good surplus at the end of the year. He would advise all farmers' associations to erect co-operative dips. They had at first got a few subscriptions together, and they had now a clear income of £10 or £15 a year. Two years ago they made a refund of ½d. per head to all the members—that year they dipped for 1d. a head.

Mr. KELLY believed that under the present regulations, if the owner of a private dip dipped any neighbours' cattle, it would be classed as public, and he would have to pay a registration fee of £2 2s. a year. It was very unfair that a private individual who happened to put through a few head should have to pay this registration fee, and it prevented cattle from being dipped. Besides, there was a fee of 10s. a year for analysis. It stood to reason that anyone who ran the dip would try to have the ingredients as good as possible. He thought the farmers ought to bring some influence to bear on the Department to alter this charge.

Mr. ORR said there was some little misunderstanding about this. He was not speaking for or against the charge. Prior to 1904, it was proved to the Department that in some cases 3d. to 6d. a head was charged for dipping in a useless mixture. On the other hand, cattle were put through some dips with a very strong mixture, which was so injurious that fatalities occurred to the cattle. Consequently, the Department said that no cattle would be allowed to travel from a dip that had not been analysed once in every six months. That in no way interfered with a man who had a dip on his premises for his own

private use, because he himself was the sufferer if it was too strong or too weak; but if he wanted to move those cattle to clean pasture, he must have his dip analysed. The chemist said that the cost, if the work was done by an ordinary analyst, would be three or four guineas, but the 10s. was merely the cost to the Department of the material used in making the analysis.

Mr. Uhlmann: How would that cut with neighbours next door? Would you have to pay that 10s.? Suppose the neighbour said he was satisfied, would the owner have to be registered?

Mr. Orr: It would not apply to neighbours—only when the cattle are going some distance.

Mr. Uhlmann thought the Department might give them some information as to the mixtures. A lot of persons were around now selling a mixture, which was perhaps three or four times more expensive than when they bought the arsenic. If the farmers had the information, it would mean pounds in their pockets.

Mr. Orr said they had distributed broadcast, Regulation 69, which contained the formula of the Departmental mixture, also lists supplying the names of the proprietary mixtures which had been found effective, and owners could therefore pick and choose for themselves. He would be glad to send the formula to anyone, as they had them ready printed.

Mr. Smith (Esk): One defect with regard to the analysis was that they were asked to send a sample once every six months. He thought it would be better if a stock inspector, without giving any notice, took an analysis.

Mr. Orr: That was what they were trying to do, but they had not enough inspectors to go round.

Mr. J. T. W. McLaughlin (Mount Alford) was not in favour of the Government subsidising the dips, but he thought the analysis fee should be abolished. There were 900 dips, which at a low calculation had each cost £100. It was a drain on the stock-owners, after the other taxes which they had to pay. They had to tax themselves to put down the dips, which showed that they were in earnest about the matter. Would their dip, which was in a central position, have to be analysed for their own use, if they did not wish to shift cattle into another district? In the event of their wishing to take them to the nearest cattle market for sale, would it have to be analysed? He would also like to ask whether the owners of immune cattle which had to be inoculated for redwater and became immune would be compelled to dip? One station-owner had a paddock full of immune stock, and he was told by the chairman of the Shire Council that the ticks were on them like a bunch of grapes. The teamsters in the vicinity had lost fairly heavily.

The Chairman: He was afraid he could not answer the question yet, until the resolutions of the Conference had been passed.

Mr. McLaughlin: Were the owners of immune cattle compelled to dip their stock?

The Chairman: Yes.

Mr. Charles (Maryborough) thought the testing of dips was most important, and that the Government should test them. A number of men from the other colonies were coming here, and if the Government showed confidence it would lead them to settle.

Mr. W. Sutton (Oakey Creek) said that not long ago they shifted eight head of cattle, and were required to get a certificate that they were dipped when they got to their journey's end. Was it likely any man would dip those eight cattle for 1½d. a head, and send down 10s. to have the dip analysed? The Department said they had not enough inspectors, but there were the dairy inspectors who could make the necessary inspections.

The Chairman said he could not give an answer to Mr. Charles's question just now, but the Department would have to consider it.

Mr. S. KELLY (Yandina) suggested that they should ascertain the feeling of the Conference with regard to the abolition of the fee for testing dips.

Mr. T. HAMLYN (Crow's Nest) thought that every dip should be tested, and that all dips should be built under the Government specification. (Dissent.) There was a dip in his district in which the grade was so steep that it was called the "cruel dip," as, if cattle were at all weak, they could not get out of it.

Mr. E. WINKS (Harrisville) did not approve of dips being built under a Government specification, but thought it was better to leave this matter in the hands of the individual.

Mr. W. M. CHARLES (Maryborough) moved—

> "That in the opinion of this Conference the Department of Stock should test all dips free twice a year."

Mr. H. R. MOON (Brookfield) seconded the motion.

Motion agreed to without dissent.

STOCK INSPECTORS SHOULD BE INDEPENDENT, NOT UNDER SHIRE COUNCILS AS AT PRESENT.

This subject was suggested by the Teutoberg Farmers' Progress Association.

Mr. C. M. NOTHLING (Teutoberg), the representative of the association, intimated that, as this matter had been fully dealt with in previous discussions, he would not ask for its further consideration.

SUGGESTIONS.

Mr. R. WEEDON (Nerang) suggested that as new settlers could not afford to erect dips in many cases, they should be assisted with advances from the Agricultural Bank for this purpose.

Mr. ALFRED GORRIE (Brisbane) suggested the appointment of a committee to gather up the crumbs of information which had been dropped at the Conference, and prepare a report which should include the papers which had been read.

VOTES OF THANKS.

Mr. N. WADE-BROWN (Gayndah), in a felicitous speech, moved that a hearty vote of thanks be accorded to Mr. Scriven for the able and efficient manner in which he had conducted the proceedings of the Conference.

The motion was seconded by Mr. W. A. A. BATES (Biggenden), and carried with acclamation.

The CHAIRMAN briefly thanked the delegates for the compliment which they had so gracefully paid to him, and expressed his obligation to the officers of his Department, whose assistance was most valuable and always most cheerfully given.

On the motion of Mr. ALEX. SMITH (Esk), a similar compliment was paid to Mr. Pound and Mr. Orr, and was suitably acknowledged.

The Conference adjourned *sine die.*

Agriculture.

FARMING ARID LAND.

By E. C. DE GARIS, in the Sydney "Daily Telegraph."

CAMPBELL'S SYSTEM EXPLAINED.

The principles underlying the Campbell system (referred to in the last article—*see Queensland Agricultural Journal*, September, 1906) briefly are:—(1) Catch all the rain that falls; (2) store it where the roots of plants can readily reach it; (3) prevent evaporation all you can; (4) practice good husbandry ceaselessly; (5) don't crop the first year you begin this plan. The results that will ensue upon the careful and regular application of these principles, Mr. Campbell declares, will multiply those produced by ordinary farming by from three to five times.

The additional labour involved does not exceed that customary in such a successful State as Iowa by more than 25 per cent. On the Australian plains, as on the American prairies, farming is cheaper and more slipshod, and at least twice the labour would be required to ensure success. As compared with some methods of farming in the dry areas that I am familiar with, I would think that probably three times the present labour would be necessary. Campbell's is not cheap farming of the "stump-jumping" or "self-sown" order. It is sound husbandry, yielding substantial profits. It is not recommended with a view to reducing labour, but that the year's results may be assured and increased.

HOW THE RAIN IS STORED.

Storing the rain in the soil is accomplished, Mr. Campbell says, "by keeping the surface of the ground always loose. It is impossible for moisture to rise to the surface through loose soil; and ground that is loose is in the best condition to receive the rain as it falls."

The water so absorbed into the soil is stored where the roots of the plants can reach it when they need it, "by stirring up the soil with a revolving disc, and then going over it again and filling up the furrows. We call this," says Mr. Campbell, "double discing." It pulverises the soil and levels if off. We keep going over it again and again, beginning early in spring and continuing through summer. After every rain we stir up the soil, either with a disc or an Acme harrow. Finally, we plough 7 inches deep in the ordinary way, and follow the plough immediately with a sub-surface packer, a machine in some respects like a disc, which makes a compact solid bottom 4 inches from the surface under the loose soil. Then we go over it again with the Acme harrow, so as to keep the top soil loosened and pulverised.

After working the soil for a year in this way by what we call "summer tilling," we put in the wheat, either in the fall or the spring, as is usual. The first year we do not put in any seed; we simply keep stirring up the soil so that it will remain loose and pulverised, and, after one year of this sort of cultivation, three crops can be grown in succession without renewing the tilling. In some cases it is better to till every year and raise a crop alternate years."

These are very explicit directions, and I have thought it best to give them Mr. Campbell's own words, so that what he really does himself may be conveyed to the agriculturist who intends to imitate him.

SEVERAL THINGS PLAIN.

After carefully considering what is proposed, farmers will recognise several matters as self-evident. Thus, if crops are to be grown every year

the ploughs must be at the work in the field at the earliest possible moment. There is no need to wait for rain before beginning. The soil will be moist enough, and a start should be made as soon as the harvest permits. The stubble can be turned in, and the disc and harrow must be kept at work right up to seeding time. This is the general rule of the system, and must be applied to all kinds of crops.

"It is simply," repeats Mr. Campbell, "a question of the thorough working of the soil. That is more important than the rainfall. After a certain amount of rain has fallen, and penetrated a certain distance into the soil, each particle of earth absorbs its share of water until the entire rainfall has been absorbed. Thus we can make 14 inches of rain go as far as 25 or 30 inches in raising all kinds of crops, or plants, or trees. We do not lose any of the rain, we have the full benefit of it. And thus is the moisture stored just where the plants may reach it when they need it."

THE PLAN NOT POPULAR.

Where Mr. Campbell has been working out his ideas and getting never less than 40 bushels to the acre, he is surrounded by farmers who are content with, even glad to get, 13 bushels to the acre. The wonder is that, with a demonstration under their eyes they do not take up the practice of the system. Mr. Campbell explains this by saying that his neighbours are "stubborn and prejudiced. There is," he says, "a popular dislike to new-fangled notions. Before I came here it was advertised for six weeks that I would explain my method of soil culture at a public meeting. I did so, and out of a court-house full of farmers only two men—John I. Osman and S. S. Hisey—adopted my recommendation, and they have been almost as successful as myself. They have had fine crops ever since, but the rest of the farmers would not even ask questions. Most of them will not come to look at my fields, although they know very well what kind of a crop I have in comparison with their own. I cannot coax them into my orchards. They keep away from the place as if it were full of contagion. In Nebraska and the Dakotas I found the same spirit, with only an occasional convert."

DEPARTMENTAL FEARS.

It is just at this point we meet the fears of the agricultural experts at Washington. They are afraid the farmers won't do the work required. The recent wet seasons will make them less likely to dread a drought, and they will go on farming in the dry areas in the old-fashioned way. All men are not gifted with energy, and that, perhaps, is another reason why the great change in method involved in the adoption of Campbell's plan is not more extensively practised. But, probably, Australian farmers will be more ready to adapt themselves to new conditions more quickly, and reap the advantages that seem so certain.

For several years Mr. Campbell conducted experimental farms on the Burlington road, Nebraska. Many of the farmers along that road adopted the method, but only a few went into it thoroughly. They seemed unwilling to take the pains and exercise the necessary patience. Still, the system is good. Witness, one man at Trenton, Nebraska, harvested per acre 41 bushels of 59 lb. of wheat under this process, while 90 per cent. of the other farmers had nothing to harvest, and none of the rest reaped more than 10 bushels per acre.

Another striking example is that of a man 8 miles south-west of Byer's Colo, last year, who harvested 1,600 bushels of corn by this system from 38 acres of ground, with 16 inches of rain, while the crops of his neighbours did not amount to anything. At Pomeroy, Kansas, where Mr. Campbell has been working out his system for the last six years, he has had six very fine crops, while out of the fourteen preceding seasons there were thirteen great failures.

A PRIMA FACIE CASE.

Surely if any doubting Thomas thinks a demonstration is needed he must admit, or if he does not the unprejudiced will, that a *primâ facie* case has been made out, and that the time has come for a thorough, intelligent, and authoritative series of experiments to be undertaken in several widely-separated areas where the rainfall does not exceed 12 to 14 inches, and where irrigating facilities do not exist. When this is done, and the system proved worthy of application, then no doubt imitators will be largely and quickly multiplied.

SOME OF CAMPBELL'S APHORISMS.

Meanwhile, it will be interesting to those who are either theoretical or practical farmers to think over some of the apothegms that occur in Professor Campbell's teaching—

In discing overlap, don't cross.

Harrow after every rain.

Packing the subsoil within an hour or so of ploughing.

Don't disc instead of plough.

But precede ploughing with a discing.

Disc early in spring.

Keep your discs sharp.

Disc 14 inches better than 16, and 16 better than 18.

The larger the disc the slower it revolves; therefore, the less pulverising effect.

Buy as broad a disc as your horses will draw.

Plenty of water in the soil makes plenty of corn.

No after-cultivating can make amends for a poor job of preparing soil for the crop.

The deeper in the ground you can get the water stored the surer you are of a big crop.

Cultivate at least once after each rain. If you don't need the water for this crop you may for the next.

Don't get the shallow idea too strongly fixed. Two and a-half to 3 inches of fine, loose soil is about the best condition.

There is no work done, cost considered, that seems to go farther towards increasing the yield of corn than that of double discing. This is also quite true with reference to all other crops.

Never allow a crust to form under the mulch any more than you would on the surface. It will get there if you don't watch closely during times of extreme heat in long dry periods.

Don't let weeds grow. Every weed means less corn.

Do not leave the field at noon unless the sub-surface packer has overtaken the plough.

In summer plough 7 to 8 inches deep.

If the soil is moist a foot or so down, and the surface kept loose, that is all that is essential.

The process of packing the under portion of furrow or ploughed ground creates three conditions to aid in carrying the growing crop over long dry periods, viz.:—

1. More water in the soil;
2. A stronger capillary movement of water;
3. More prolific growth of roots.

Don't pack the surface, it increases the loss of water by evaporation.

Less seed is needed in packed subsoil than in loose soil for the same crop result.

Pack the lower portion of your ploughing the same day as you plough, to save the moisture.

It is not uncommon that a single hour's extreme condition of the soil, as respects rapid evaporation, will reduce the crop one-half.

EVAPORATION LOSSES IN IRRIGATION.

Bulletin 177 of the Office of Experiment Stations, United States Department of Agriculture, just issued, gives the results of experiments covering several years, performed in co-operation with the State of California, for the purpose of estimating the losses of water by evaporation from irrigating fields and of cultivating fields in checking these losses. This work was done in California, under the supeivision of Samuel Fortier, under the direction of Elwood Mead, Chief of Irrigation and Drainage Investigations.

In southern California water has a very high value, and the supply is limited, making it important to economise in every way possible. Thousands of dollars have been spent in lining ditches with cement, and in putting in underground pipes for carrying water to the points where it is put upon the land, so that losses in transporting water, which in open earth channels often equal one-half the supply at the head of a ditch system, have been largely eliminated. It has been realised that there are still large losses occurring with the water is applied to the soil, but there has been little or no knowledge of the extent of these losses or the exact effect of different methods adopted for checking them. This work of Professor Fortier's is an attempt to measure both by means of experiments with soils in water-jacketed tanks, each tank containing from 300 to 1,300 lb. of soil. Water was applied to the soils, and the soils were cultivated in such manner as to resemble the different methods of treating soils in irrigated fields.

In two experiments with cultivation, as soon as possible after the application of water the losses from cultivated soils were but one-half and one-third respectively as great as those from similar soils receiving the same quantities of water, but not cultivated after irrigation. The savings were 5 and 2½ per cent. of the quantities applied in the two experiments.

A second series of experiments included the application of water on the surfaces, not followed by cultivation, and the protection of the wet surfaces by placing upon them mulches of dry soil 4, 8, and 10 inches thick. In this case the losses in fourteen days following irrigation were: From unprotected soil, 23 per cent. of the water applied; from soil protected by a 4-inch mulch, 6 per cent.; from soil protected by an 8-inch mulch, 2½ per cent.; and from soil protected by a 10-inch mulch, 1½ per cent. of the water applied. After these fourteen days the losses from all were substantially uniform.

Another experiment included applying water to the soil, and the surface, and in furrows 3, 6, 9, and 13 inches deep, all soils being cultivated on the third day after irrigation began. The experiment covered ten days, and at the end of that time the losses were: From the surface-irrigated soil, 24 per cent. of the water applied; from soil irrigated in furrows, 3 inches deep, 21 per cent.; in 6-inch furrows, 12 per cent.; the loss in the last case being half that in the first.

These experiments related especially to the irrigation of orchards, where it is possible to apply the water at considerable depths, and to cultivate the soil to depths of 10 or 12 inches without injury to the trees. Naturally, these methods cannot be used in the irrigation of grain and hay, where the water must be applied at or near the surface, nor on crops whose root systems are near the surface, so that deep cultivation cannot be practised. They show, however, that where water can be applied in deep furrows, and where irrigation can be followed by deep and thorough cultivation, half the water ordinarily lost by evaporation can be saved, and that this equals 10 to 20 per cent. of the water applied, making possible an extension of, say, 15 per cent. in the area irrigated with a given supply of water. In other words, if land has been receiving a depth of 2 feet of water under the old system, it need receive only 20 inches under the new system, or a stream which has irrigated 100 acres can be made to serve 115 acres.

THE USEFUL TOAD.

We have on previous occasions drawn the attention of horticulturists to the value of the harmless toad as an insect-destroyer. It now appears that, according to the "Agricultural News" of Barbados, the food of the common toad (*Bufo aqua*), in addition to the insects we mentioned as forming this animal's food, includes the cotton worm which is now known to be readily eaten by it.

Large numbers of toads may be seen in any cotton field in which the worm occurs, and by watching them quietly for a time one may see them picking up any worms that drop to the ground. The toads do not notice a cotton worm that lies quiet, but they are very quick to observe any that are crawling along, and pick them up with remarkable rapidity.

In a cotton field in Barbados recently, where the worm was more than usually abundant, large numbers of toads had assembled, as many as eight or ten being in sight at one time. When the plants were jarred and the worms shaken to the ground, the latter were quickly snapped up by the toads. Cotton worms were thrown to several toads; one took twelve, another ten, and others took nearly as many. There would seem to be no danger of the toads being poisoned by eating the worms that are killed by Paris green, since only those worms are eaten that are quite active when they are on the ground.

GOOD ROADS.

Some time ago we published several articles on road-making and the preservation of country roads, written by the Hon. A. J. Thynne, M.L.C., but very little has been done in the way of improving the condition of our roads. Keeping roads in repair is an expensive business, but destroying them is a very easy process. There is nothing that has more to do with preserving the roads than the width of the tires used on vehicles. Where heavy loads of timber are constantly moving, the question of the width of tire is a most important one.

A road built of any kind of material will last five times as long when wide instead of narrow tires are used. It is a wasteful business, to say the least, to spend 1,000 dollars or more on a mile of road and then let it be cut up with narrow tires.

Tires should have width according to the weight they carry—a ½-ton load, 3-inch; 1 ton, 4-inch; 1½-ton load, 5-inch; a 2-ton load, 6-inch tires, and those wagons that carry heavier loads should be provided with 8-inch tires.

THE FUTURE OF AUSTRALIA LIES IN ITS AGRICULTURE.

Australia's history lies in her future, and her future in her agriculture. A clever article in "Public Opinion," one of a series of studies in colonial possibilities, tells of the wonderful growth of the colony, and also conveys to one the full force of the statement that its future lies in its agriculture. In fifty years Australia's primary production of minerals amounted to £650,000,000, her agriculture produce £600,000,000. In that period her population multiplied by ten—from 400,000 to 4,000,000. The remarkable recuperative powers of the colony will be understood best when it is stated that the drought of 1896-1902 halved her stock of sheep (over 100,000,000 in 1893), and reduced her cattle from 11,000,000 to 8,500,000. The effect of drought and tick in Queens-

land was to reduce cattle from over 6,000,000 in 1893 to under 2,500,000 in 1903, sheep from 20,000,000 to 8,000,000. The loss in that State alone must have been over £30,000,000. But, as a set-off, it should be noted that New South Wales in 1906 has a surplus of £800,000, and it is expected that the exports for the year will amount to £44,000,000, previous best having been £36,757,000. The imports are expected to total £33,900,000, an increase of £4,500,000, as compared with the previous year. Australia, if not exactly an Eldorado, is not the panic-stricken, drought-ridden spot that alarmists would have the ignorant believe. Her development is only just begun; the big fortunes are yet to be made; the vast resources still to be exploited.

To still further emphasise the wonderful recuperative power of the Commonwealth, the writer of the above should have added that within the last four years—that is to say, between the years 1902, when the drought broke up, and the commencement of 1907—cattle, sheep, and horses increased rapidly. In January, 1906, the 7,213,985 sheep which survived the drought had increased to 12,535,231; and in January, 1907, a further increase brought the numbers up to 14,872,413, or more than double the number in 1902. Similarly, cattle, which had dwindled to 2,543,471, increased to 3,390,421; and horses increased from 399,122 in 1902 to 450,675 in 1906. Pigs, however, decreased by 26,290. It is probable that a yet greater increase will be shown when the whole of the live-stock returns for 1907 are received by the Government Statistician. The magnificent seasons of the past five or six years have also had the effect of correspondingly increasing the returns of agricultural produce, and the general prosperity of the agricultural population naturally has had a beneficial influence on other industries of the State. In common with the other States of the Commonwealth, Queensland will have a substantial surplus at the close of the financial year this month.—Ed. "Q. A. J."]

CAN THE FARMER AFFORD HIGH-PRICED LABOUR?

When discussing the question of cutting straw for the feeding of steers at the Brandon Winter Fair, Prof. J. H. Grisdale, of the Central Experimental Farm, Ottawa, was asked whether it would pay the average farmer to do such work when he had to keep hired help for that purpose. In replying, Mr. Grisdale gave some interesting figures that are well worth careful consideration. He said that for some time he had been studying this question, and he had come to the conclusion that the farmer who hired the most help in proportion to the amount of land under cultivation got the best returns. Upon investigation he found that the man who let his land run to pasture and employed the least possible labour, amounting to a man's time for about half a year, got a profit of about 200 dollars to 250 dollars per 100 acres of land. Where grain was grown on part of the land, and labour to the value of one man and a-half for a year was employed, the profits were from 800 dollars to 1,000 dollars per 100 acres. Where general live-stock work was gone into, requiring the employment of three men, the annual profit from 100 acres was from 1,500 dollars to 2,000 dollars. On dairy farms where four or five men were employed the year round, profits per 100 acres amounted to from 3,000 dollars to 4,000 dollars. Under the most intensive system of farming, where twenty-five men were employed, the profits from 100 acres ran up as high as 20,000 dollars.

Mr. Grisdale claimed that these figures showed conclusively that the greater the amount of labour there is required on a farm, the greater will be the proportionate profits, provided, of course, that the labour is employed intelligently.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 30TH APRIL, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Chocolate ...	Shorthorn ...	5 Mar., 1907	922	3·6	36·88	
Blank ...	Jersey-Ayrshire	4 Feb. ,,	651	4·6	33·68	
Poppie ...	Guernsey-Jersey	24 Feb. ,,	702	4·2	33·03	
Rhoda ...	Grade Shorthorn	12 Mar. ,,	817	3·6	32·68	
Lowla ...	Ayrshire ...	25 Mar. ,,	834	3·4	31·38	
Hetty ...	,, Sh'rth'rn	27 Mar. ,,	685	4·0	30·61	
Pee-wee ...	Holstein ,,	6 April ,,	640	3·8	27·10	
Ivy ...	Jersey	17 Jan. ,,	498	4·6	25·76	
Grace ...	South Coast ...	28 Jan. ,,	579	3·8	24·51	
Dripping ...	Holstein Sh'rth'rn	28 Nov., 1906	546	4·0	24·39	
Renown ...	Ayrshire ...	27 Mar., 1907	648	3·4	24·38	
Dewdrop ...	Holstein ...	24 Mar. ,,	639	3·4	24·03	First calf
Cheerful ...	Shorthorn ...	17 Feb. ,,	543	3·8	22·98	First calf
Whitefoot ...	Holstein Sh'rth'rn	7 Nov., 1906	571	3·6	22·84	
Cocoa ...	Jersey	13 Dec. ,,	478	4·2	22·48	
Wonder ...	Shorthorn ...	7 Dec. ,,	499	4·0	22·31	
Winnie ...	,, ...	11 Sept. ,,	496	4·0	22·13	First calf
Linda ...	Ayrshire ...	12 Nov. ,,	461	4·2	21·68	
Carrie ...	Jersey	3 Dec. ,,	438	4·4	21·63	
Careless ...	,, ...	2 Nov. ,,	485	4·0	21·67	
Mona ...	Holstein Sh'rth'rn	16 Jan. ,,	424	4·4	20·93	
Cuckoo ...	Jersey	27 Dec. ,,	435	4·2	20·46	

Cows fed on natural pasture, with two hours daily on lucerne.

GARGET AND ITS TREATMENT.

Garget is a disease of the udder of cows, for which the following remarkable treatment has, according to a correspondent of the Florida "Southern Ruralist," proved successful:—

Garget is not an uncommon trouble, and the remedy is simple, and should have a trial.

I have a Jersey that gives 5 to 6 gallons of milk when fresh, and left her three years ago with a big calf three or four months old. I returned after three months, and found her left hind teat practically dry. Investigation proved that the caretaker milked only what he needed and turned the calf to the cow to strip her.

The teat became bruised, and she refused to have it stripped in this way, hence garget.

Now to garget again. I noted in your paper an article from Nebraska telling how to restore a dry teat, so wrote to Lincoln for full particulars, but nothing was added to your very full directions, so I hunted up an old bicycle pump, threaded a piece of hard, dry wood to screw on end of rubber tube of

pump, and cleaned out pith and inserted milking tube. Three times a week I inflated the udder and rubbed it with vaseline; sometimes I left it full over night, but usually squeezed all the air out I could get without too much delay. I wrote again to Nebraska, as I did not get a drop more milk, and was told that a cow that had been dry practically (two tablespoonsful at a milking being all obtainable) for two years could not be cured easily, so after a while I abandoned the treatment excepting now and then. The cow was dried up one month before calving. When she came in the udder filled, and that teat gives more milk than any other. It is my firm belief that if a heifer of 1 or 2 gallons capacity had all four of her teats treated in this manner after her first calf that ordinary range cows would increase 25 to 33 per cent. I ask the "Ruralist" to interest the Georgia or Florida Experimental Station, and get them to try it, and give their results to the public. I have given in this article all I can tell, so friends interested can follow it, as it will save many a good cow from the butcher's block. But please remember not to expect it on a decreasing milk supply, but stick to it just before she calves, and above all things do keep the stripping in your own hands, and wean all future calves after a week. If the cow fails to let down milk, let the calf get at the teat for a minute or two on left-hand side, then tie it again where it will nibble its mother's food, and it soon learns to eat, and the cow lets down in a day or so as before calving. One more idea, and I close. I have no trouble breaking a heifer, as from the day it is dropped we play with its udder, pulling the teats, and when she calves she is submissive, and in a week is as steady as an old cow.

DESCRIPTIVE SPECIFICATION OF CRUSH AND SPRAY TO BE USED FOR DISINFECTING CATTLE AND HORSES AFFECTED WITH TICKS, IN PLACES WHERE A DIP IS NOT AVAILABLE.

The arrangement illustrated herein is already in use in Brisbane by the Department of Agriculture and Stock for disinfecting stabled animals prior to being allowed to proceed to clean country; it can easily be somewhat modified in construction and adapted to the purpose of spraying small herds of dairy cattle, at comparatively small cost.

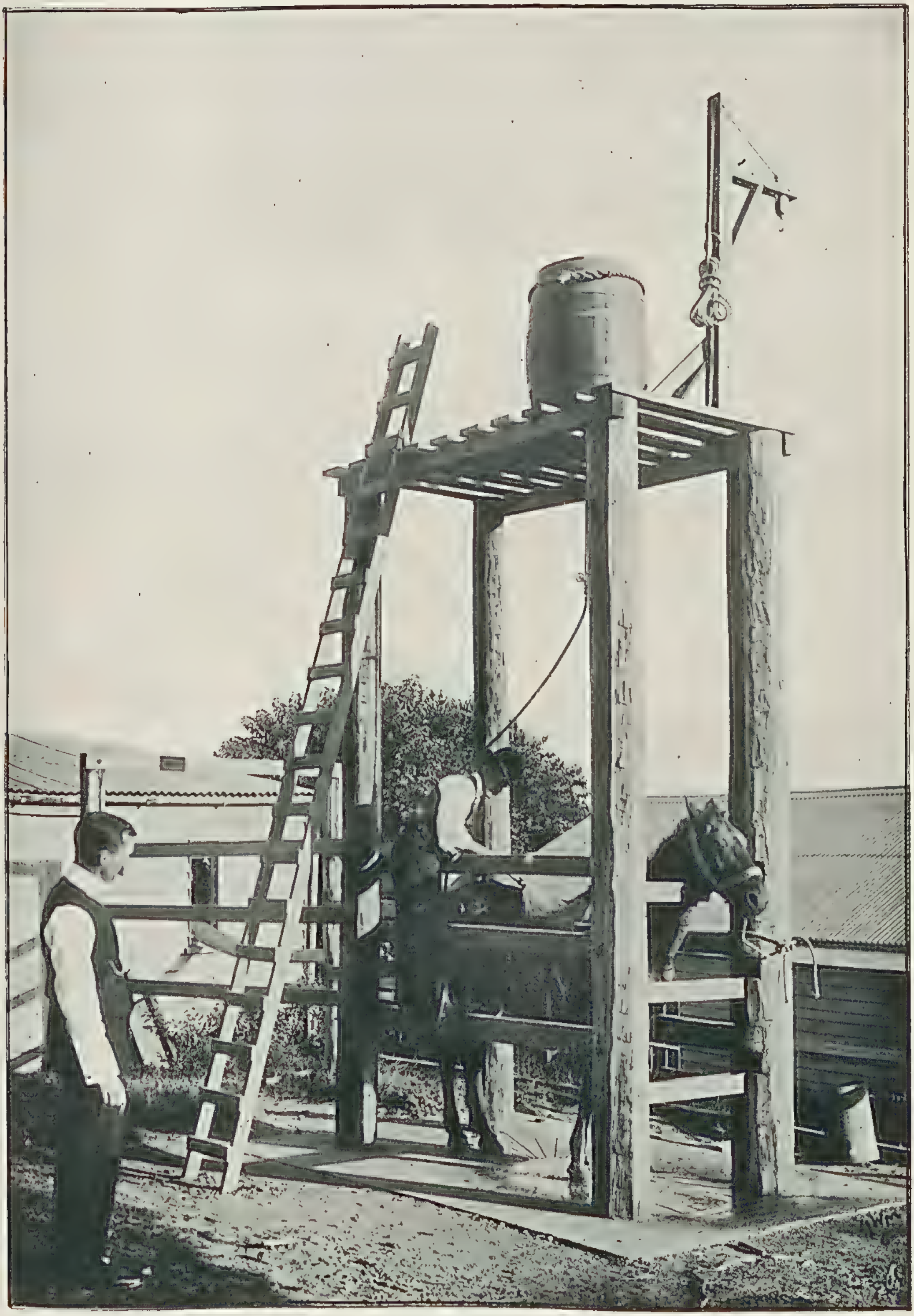
The posts should be of sound ironbark, straight and true; they need not be more than 6 inches in diameter when dressed clear of sap; they should be set in the ground fully 3 feet, and should stand at least 12 feet 6 inches above the ground line, which is the height shown in the photograph. By increasing the height of the platform or stage to 16 feet, an additional pressure of nearly 2 lb. per square inch will be obtained, which will add to the efficiency of the spray.

The posts underground should be well tarred with hot coal tar before fixing; they should be set out so that the distance between the rails, when the latter are bolted in position, will be 2 feet 3 inches apart in width and 6 feet 6 inches apart from front to back.

The rails, which may be of round or sawn timber, should be checked into posts, and bolted with ½-inch cup-headed bolts; end rails should be 5 feet 3 inches, and side rails 5 feet 6 inches from ground line to the top, and intermediate rails spaced at equal distances apart; rails on one side may be secured as slip rails, so as to be easily removed in case of accident, when it may be found necessary to remove the animal.

The stage or platform should have 4-inch by 3-inch hardwood plates checked into and well bolted to posts, and 6-inch by 1½-inch hardwood planking on top, well nailed down with a space of 2 inches between each.

Plate XIX.



Crush and Spray,

Used by the Department of Agriculture and Stock, Brisbane, for Disinfecting Stabled and Groomed Horses prior to same being allowed to proceed to clean country.

It is advisable to fix a 3-inch by 2-inch handrail round the stage 3 feet 6 inches high, with 3-inch by 3-inch newel posts firmly bolted to plates or posts.

The hoisting derrick should be of 4-inch by 4-inch hardwood, halved and bolted to plates and to handrail, with bracket projecting about 2 feet tenoned into post and well strutted, fitted with a 4-inch pulley block and a sheave at top of post for rope to run through, about 45 feet of rope should also be provided.

A 36-gallon ordinary wood cask or a 200 or 400 gallon tank may be fixed in position on the platform and a 6-feet length of $\frac{3}{4}$-inch galvanised-iron pipe with diminishing socket and $\frac{1}{2}$-inch wheel valve attached to the same, with about 15 feet of $\frac{1}{2}$-inch best rubber hose, and brass nozzle and reversible spray and jet. A suitable ladder should be provided for access to the staging.

The spraying floor should be 10 feet by 7 feet of 4-inch concrete composed of 1 part cement to 4 parts broken metal 1-inch gauge, and 2 parts clean coarse sand, laid with a slight fall to the centre, and the surface grooved so as to afford good foothold for the animals. From the centre a shallow open drain should be formed to conduct the fluid to the "save-all" pit, which should be placed close to the edge of the concrete floor; this pit may be constructed of woodwork or brickwork 18 inches by 18 inches by 2 feet 3 inches deep. An oil drum bucket should be provided for the same, with a funnel screen of fine wire gauze, to catch and screen the waste liquid flowing from the spraying floor; when the bucket is full, it is hoisted to the stage and discharged again into the barrel.

The derrick and hoisting tackle may be dispensed with if a small Douglas pump with $1\frac{1}{4}$-inch suction pipe and valve at bottom be fixed on the stage.

On some dairy farms a suitable elevated position may be found on which the barrel or tank could stand without constructing a high stage; in such cases a crush only would be necessary.

AGE LIMITS OF DAIRY COWS.

A bulletin from the Wisconsin Station states that a cow is at her best during her fifth and sixth years, up to which time the production of milk and butter-fat by cows in normal condition increases each year. The length of time the cow will maintain her maximum production depends on her constitutional strength, and the care with which she is fed and managed. A good dairy cow should not show any marked falling off until after ten years of age. Many excellent records have been made by cows older than this. The quality of the milk produced by heifers is somewhat better than that of older cows, for a decrease has been noted of one to two-tenths of one per cent. in the average fat content for each year until the cows have reached the full age. This is caused by the increase in the weight of the cows with advancing age. At any rate, there seems to be a parallelism between the two sets of figures for the same cows. Young animals use a portion of their food for the formation of body tissue, and it is to be expected, therefore, that heifers will require a larger portion of nutrients for the production of milk or butter-fat than do other cows. After a certain age has been reached, on the average seven years of age, the food required for the production of a unit of milk of butter-fat again increases both as regards dry matter and the digestible components of the food. A good milk cow of exceptional strength, kept under favourable conditions, whose digestive system has not been impaired by over-feeding or crowding for high results, should continue to be a profitable producer till her twelfth year, although the economy of her production is wont to be somewhat reduced before this age is reached.

Poultry.

A FARM YARD DETECTIVE.

WHAT THE TRAP-NEST DOES.

It shows just what each hen is doing. Perhaps a few hens of the flock lay most of the eggs. It picks these out and identifies the 300-egg hen, the 200-egg, the 100-egg, the 50-egg, and the drone, and thus enables the poultryman to choose his stock and build up a good laying strain in a very short time. Feeding the drones is one of the greatest leaks with the poultryman.

It picks out the winter layers. A hen may lay well in the spring and summer, but stop when winter comes. With the trap-nest a good strain of winter layers may be built up.

It enables one to get acquainted with each individual hen. The frequent handling in removing the hen from the nest tames her, and it is the tame hen that is the paying hen. By frequent handling, the breeder will know when anything goes wrong with the hen, and remedy it.

It prevents egg-eating, as the egg-eater is easily detected and killed. The infrequent handling and removing from the nest discourages broodiness.

It picks out the hen that lays the white egg, the yellow egg, the unfertile egg. It may be that two or three hens of a flock lay most of the unfertile eggs, as has been proved by the trap-nest.

It picks out the hen that raises the best chicks. Not always the highest-scoring hen raises the winning chicks. With the trap-nest a breeder can study the results of his matings with each hen. He may have a pen of ten hens, and all the advantages of a pen of one hen. The trap-nest is the only practical way that a breeder can pedigree his stock. The day is surely coming when poultry will be pedigreed as is other thoroughbred stock.

While most breeders prefer the incubator to the sitting hen, the trap-nest comes as a boon to him who has the care of sitting hens. They may be placed in a building or yard away from the laying hens, removed once a day for feed and water, and when they return to the nest they shut themselves in and the other hens out, so they cannot crowd on and break the eggs.

Trap-nests have come to stay. They have been tested, and their value demonstrated. The progressive breeder is welcoming them with delight as a most valuable aid in improving his flock, and the time is not far distant when he who does not use them will have very little demand for his stock.

Half the failures in incubating duck eggs are caused by insufficient airing. Too many amateurs are afraid to keep the eggs out a minute after turning. As a matter of fact, in normal seasons, the eggs can be aired twice daily, for a quarter of an hour the first week, twenty to thirty minutes the second, thirty to forty the third and fourth weeks till the twenty-fifth day. Put in your moisture at this stage, and keep the machine closed till they start to chip. Replenish the water quickly, and close up again.—"New Zealand Farmers' Weekly."

THE VALUE OF GREEN BONE.

The invention of the green bone cutter has certainly been a valuable innovation, and all well-regulated poultry farms count upon this piece of machinery as necessary for the successful prosecution of the poultry work. The green bone must be judiciously given, and must not be offered the fowls with a lavish hand. A pound of cut bone for every sixteen head of stock is about the proper amount, and even then it should not be given any oftener than every alternate

day. A little goes a great way. Green bone is a complete food. It is rich in nitrogen, albumen, carbonates, and phosphates of lime. These ingredients are essential for the making of the egg.

EGG-EATING DOGS.

To cure a dog of eating eggs, draw the contents of two or three eggs by making holes in both ends, and fill in with a paste of some kind containing a little red pepper. Put these in the nests where the pup is accustomed to find eggs. Do not practise cruelty on the young brute by using a large quantity of pepper—a very little will suffice to give him a poor opinion of eggs as a diet for dogs.

Another good plan is to draw the contents of the egg, put some strong liquid ammonia into it, and close hermetically. The dog who cracks this egg will never crack another. The dose, moreover, will do him no harm.

REARING CHICKENS.

THE NATURAL PLAN.

BY M. FERN.

In the rearing of chickens, as in the case of the hatching, there is the natural plan—*i.e.*, with the hen, and the artificial method with the foster-mother or brooder.

I think there is little doubt amongst practical poultry-raisers that the hen is the best method of brooding chicks, and where it is possible, even with chicks hatched by incubators, the best results will always be obtained by allowing the chick to run with the hen.

AFTER HATCHING.

After hatching, if a number of hens have been set together, or if an incubator has been used, the chicks when thoroughly dry, should be sorted amongst the best of the hens. Always use hens that have brought out the largest batch, as it is a sure sign of their being strong and possessing plenty of vitality. Each hen according to size can be given from fifteen to twenty chickens. The mothers may be confined for the first week or two in boxes with slatted fronts, to enable the youngsters to have a free run. If a number of hens are being used, they can be placed in their boxes in rows, allowing the chickens to mix. If the chicks are of different colours, it is a good plan to mix them under each hen, otherwise, if a hen is given chicks all of one colour and another stray one of a different colour from a neighbouring box should by chance get into the wrong box, the mother hen may kill it. This is not likely to occur if she has several of different colours.

PLACING THE COOP.

The coop should, if possible, be placed on a grass run, as grass is one of the most necessary foods in the rearing of chicks. It should be sheltered from the sun and bad weather. I prefer wooden floors, slightly raised above the level of the ground. The coops should be moved on to new ground regularly every few days.

MARKING CHICKS.

If the breeder is breeding on careful lines, and desires to know the pedigree and particulars of strains, &c., the chicks should be marked on leaving the incubator or nest. This should be done by punching a hole in the web of the foot. Special punches can be obtained for this purpose at any poultry supply house. As there are two webs on each foot, it is possible to get sixteen distinct

markings, and if particulars are recorded, no matter how the chicks get mixed up under hens, particulars of their breeding can always be ascertained by the punch mark.

SICKLY OR DEFORMED CHICKS.

All deformed or weak-looking chicks should be killed at sight; there is no economy in attempting to rear them, and they are only taking up the time and room of healthy birds. It is the puny chick that always brings trouble and disease amongst the flock.

FEEDING THE CHICKS.

As a general rule, chicks should not be fed for twenty-four or thirty-six hours after hatching. They can safely be kept for even a longer period than that without food or water; in fact, at that age they can be safely sent, if secured in a comfortable box, to distant parts of the State without feeding.

As to feeding, there are as many systems as there are breeds, and every breeder swears by his own system. I think it does not matter so much about any particular system as long as *some* system is used. A great mistake is made by beginners in chopping and changing their methods of feeding at the bidding of every passer-by. When you get on to a good system, stick to it. Personally, I am a great believer in the dry system of feeding. This applies to both brooder chicks and those running with the hen. In this method all foods are given in a dry state, and all sloppy or moist foods are avoided, the idea being to let the chicks do the mixing. By this method the food can be scattered in the litter, and the little birds can pick up the crushed grain, getting by this means plenty of exercise while scratching for their food. A simple plan, if a small lot are being raised, is to purchase a prepared chick food, put up by a reputable dealer, or a very good mixture can be made at home of the following:—

6 lb. cracked wheat.
2 lb. fine cracked corn.
1 lb. rolled oats.
1 lb. millet seed.
½ lb. broken rice.
2 lb. fine beef scrap or 1 lb. dried blood.
½ lb. fine cracked bone.
6 lb. sharp grit.

This can be fed either in a self-feeding hopper or in the litter every two hours for the first three days. From the third to tenth day, every three hours.

In quantity, for the first three days, a large handful to fifty chicks every two hours, gradually increasing the amount. The hopper will do away with all the trouble of feeding if sufficient of the mixture is placed in to fill it. This will keep the birds going according to the size of the hopper and the number of chicks.

Fresh water, kept in the shade, and plenty of crushed charcoal in a shallow box should be supplied.

BROODER CHICKS.

In the case of chickens to be raised in a brooder or foster-mother, great care has to be taken that the birds get all their needs supplied. The first of these is warmth. On being removed from the incubator after being thoroughly dry, they are often left in the incubator for fifteen or twenty hours; the brooder should be heated in readiness for the birds. The general rule is to run the brooder for the first week or so at about 90 degs. Fahr., and gradually lower the temperature to 70 degs. in the third week.

STYLES OF BROODERS.

There are numerous makes on the market, and most of those made by reputable firms are doing good work. Any handy man, however, can construct

a satisfactory brooder at a small cost. The accompanying design is a good one, and shows the attached run. The heat is produced by a lamp in the centre of the box. A very simple and effective brooder can be made by cutting an ordinary box about 2 feet 6 inches square to the shape shown in the picture, and placing

Poultry Brooder and Run.

a false bottom in the box, and on the floor thus made, cut a hole large enough to allow, say, a small biscuit-tin to go partly through, and place the lamp inside the tin. Punch a few holes to allow the heat to escape. Chicks will nestle around the tin and be quite happy. If too hot, the tin may be covered. The sides of the box must be ventilated.

Very successful brooders are used without any lamp, and have only wool strips cut and tacked across the top of the brooder, and just long enough to nestle down on the backs of the chicks. I have also seen a sheep skin tacked down, and the chickens cuddled under it perfectly happy.

Running the Brooder.

The floor of the brooder should have a layer of sand covered with chaff as bedding. This also makes splendid scratching material for the first few days.

Feeding.

The same formula can be used as directed above. Everything must be kept within reach of the chicks—viz., crushed charcoal, grit, water, &c.

Number of Birds to a Brooder.

It is never advisable to run more than forty or fifty chicks, as allowance must always be made for their growth. The brooder that is just large enough to hold sixty chicks a week old will not be nearly large enough in three weeks. Breeders often overlook that fact.

GENERAL NOTES FOR EITHER THE FOSTER-MOTHER OR HEN.

Chicks should be kept growing from the shell up. There should be no check to their growth, and time lost at the beginning is never caught up. It is the first few weeks' care that decides the future condition of your birds. Be regular in feeding, particularly with brooder chicks. If you cannot give the birds regular attention, use a self-feeding hopper, as shown in the sketch, and a drinking fountain; the birds will then be able to help themselves.

GRIT AND SHELL BOXES AND DRINKING FOUNTAIN.

The whole success of your venture depends on the handling of the young stock.

Cleanliness is absolutely necessary in coops and brooders; they must be cleaned regularly and often.

MEAD, OR HONEY BEER.

The following recipe will be found to make a very good mead, and its simplicity of manufacture should commend it to any one:—Put into a clean boiler 5 gallons of rain water. When hot, add 1 quart of pure honey. Boil gently for 1½ hours, skimming often. Empty into earthen vessel, and when blood warm pour into a clean cask. The bung should be put in loosely. If the cellar is warm, fermentation will begin in from 5 to 15 days. After 14 days' fermentation, draw off into another cask, leaving the dregs. In the second cask fermentation should be allowed to go on from 10 to 14 days. When the mead is calm, so that nothing more is heard in the cask, close the bung. Allow 30 days for the mead to clear, then draw off into bottles, cork well, and pack in sand. The ancient Germans attributed health and longevity to its use. In cases of fever it will be found of great benefit, not having the injurious effects which are attributed to wine and beer, and is a delightfully cool and refreshing beverage.

The Orchard.

PROGRESS REPORT ON PINEAPPLE MANURING EXPERIMENTS.

(Conducted under the supervision of the Agricultural Chemist and the Instructor in Fruit Culture.)

MRS. STUCKEY'S CLAYFIELD. ROUGH LEAF PINES.

The whole plot looks well, and the ground is in good order and free from weeds. The growth of the plants for the five months they have been planted is very satisfactory, and they have developed a strong root system that has gone down at least 18 inches into the soil.

Complete manures, containing nitrogen in the form of blood, phosphoric acid in the form of Thomas's phosphate, and potash in the form of sulphate of potash, have produced very good results.

The row manured with an incomplete fertiliser containing no nitrogen is distinctly poorer than any of the other rows to which nitrogen has been applied.

The row manured with bone dust only is also much below the average. The row manured with Eagle Farm fertiliser looks very well. The row of pines planted with untrimmed suckers is still the best in the plot.

The results so far may be briefly stated as follow:—

1st.—The thorough preparation of the soil to a depth of at least 18 inches has had a marked effect on the deep rooting of the plants.

2nd.—The cultivation has tended to conserve moisture, as the soil contained an ample supply of moisture for the proper development of the plants.

3rd.—Nitrogen is essential to the production of a strong, rapid, and healthy plant growth.

4th.—Dried blood is a better source of nitrogen than sulphate of ammonia or bone meal.

5th.—Phosphoric acid in the form of bone meal has produced poor results.

6th.—Complete manures are the most satisfactory.

MR. GOLLAGHER, NUNDAH. SMOOTH LEAF.

Growth uneven in the different rows, and not as healthy or vigorous as could have been wished. Soil evidently contains an insufficient quantity of humus, and manures consequently have not produced the best results.

Soil in good order. Still plenty of moisture.

Plants have developed a good root system.

The results may be briefly stated as follow:—

1st.—The thorough preparation of the soil prior to planting has resulted in a good root development, and has tended to conserve moisture in the soil.

2nd.—Manures containing no nitrogen have produced very poor results, thus showing that nitrogen is essential to the production of a vigorous plant growth.

3rd.—Complete manures have produced the best results.

4th.—Bone dust has had little effect when used alone.

MR. CORBETT, NUNDAH. SMOOTH LEAF.

Results very satisfactory. Plants have made a vigorous growth, and are of a fine dark healthy colour. Soil in fine order, and retaining moisture well. Root growth very strong and deep down.

The results may be briefly stated as follow:—

1st.—The deep working and thorough preparation of the land prior to planting has had excellent results, and has been conducive to the production of a fine root system.

2nd.—Complete manures have had the best effect.

3rd.—Absence of nitrogen in a manure stunts the development of the plants.

4th.—Nitrogen in the form of dried blood is preferable to that in the form of sulphate of ammonia.

5th.—It is no advantage as far as can be seen at present to use more than 150 lb. of potash, 75 lb. of phosphoric acid, and 75 lb. of nitrogen to the acre.

Doubling this quantity has had no ill effects, but it has not produced results superior to those obtained by the above quantity which we have taken for our standard.

This result was also borne out at Mrs. Stuckey's and Mr. Gollagher's.

MR. J. ATTHOW, NUDGEE.

The whole of the manured work looks well as the result of the treatment it has received—viz., first manuring with commercial fertiliser in 1905, then with cow-pea in 1905 and 1906.

This plot was replanted 13th April, 1906, and the suckers made little if any growth till November, 1906, since when they have done well.

This plot will get a further complete manuring in August, 1907, and should produce a good crop of fruit next summer.

MRS. STUCKEY'S, CLAYFIELD.

As this plot is liable to injury by frost, arrangements will be made to cover the rows with hessian. Mr. Brünnich will attend to this matter in my absence.

ALBERT H. BENSON.

3rd May, 1907.

EXPLANATION OF PLATES.

PLATE XX., FIG. 1—Mrs. STUCKEY, Clayfield.—Rough pines, planted 4th December, 1906.

Row 1.—Untrimmed suckers, manured with—

$$\left.\begin{array}{l}\text{300 lb. sulphate of potash} \quad \ldots \quad \ldots\\ \text{500 lb. Thomas' phosphate} \quad \ldots \quad \ldots\\ \text{600 lb. dried blood} \quad \ldots \quad \ldots \quad \ldots\end{array}\right\}\text{ per acre }\left\{\begin{array}{l}K_2O = 150\text{ lb.}\\ P_2O_5 = 75\text{ lb.}\\ N = 75\text{ lb.}\end{array}\right.$$

Complete manure.

FIG. 2.

Row 6.—Trimmed suckers, manured with—

$$\left.\begin{array}{l}\text{300 lb. sulphate of potash} \quad \ldots \quad \ldots\\ \text{500 lb. Thomas' phosphate} \quad \ldots \quad \ldots\end{array}\right\}\text{ per acre }\left\{\begin{array}{l}K_2O = 150\text{ lb.}\\ P_2O_5 = 75\text{ lb.}\end{array}\right.$$

Incomplete manure—no nitrogen.

PLATE XXI., FIG. 3—Mr. GOLLAGHER, Nundah.—Smooth pines, planted 28th November, 1906.

Row 12.—Trimmed suckers, manured with—

1,000 lb. bone dust per acre.

Incomplete manure.

FIG. 4.

Row 13.—Trimmed suckers, manured with—

$$\left.\begin{array}{l}\text{300 lb. sulphate of potash} \quad \ldots \quad \ldots\\ \text{500 lb. Thomas' phosphate} \quad \ldots \quad \ldots\end{array}\right\}\text{ per acre }\left\{\begin{array}{l}K_2O = 150\text{ lb.}\\ P_2O_5 = 75\text{ lb.}\\ N = 75\text{ lb.}\end{array}\right.$$

Complete manure.

Plate XX.

Pineapple Manuring Experiments on Mrs. Stuckey's Farm, Clayfield.

Plate XXI.

Pineapple Manuring Experiments on Mr. Gollagher's Farm, Nundah.

Plate XXII.

Pineapple Manuring Experiments on Mr. Corbett's Farm, Nundah.

PLATE XXII., FIG. 5—Mr. CORBETT, Nundah.—Smooth pines, planted 4th December, 1906.

Trimmed suckers, manured with—

300 lb. sulphate of potash	per acre	K_2O	= 150 lb.
500 lb. Thomas' phosphate		P_2O_5	= 75 lb.

Incomplete manure—no nitrogen.

FIG. 6.

Trimmed suckers, manured with—

600 lb. sulphate of potash	per acre	K_2O	= 300 lb.
1,000 lb. Thomas' phosphate		P_2O_5	= 150 lb.
1,200 lb dried blood		N	= 150 lb.

Complete manure—double quantity.

The above photographs were taken by Mr. H. W. Mobsby on 1st May, 1907.

HOW LEMONS ARE CURED.

Many of our readers have doubtless wondered why it is that, while our oranges and grape fruit compare favourably with those of any country for fine smooth skin and texture, Florida lemons are rougher and not as pleasing to the eye as imported fruit. The fact is, all imported lemons, as well as California fruit, are put through an elaborate curing process. This process is described by Prof. B. T. Galloway, Chief of the Bureau of Plant Industry at Washington, in the "Youth's Companion," as follows:—

The lemon industry is not so important as that of the oranges. Prior to eight or nine years ago the larger portion of our lemons came from abroad, especially from Italy. The production of American lemons, however, has been greatly increasing, most of them being grown in California.

Lemons intended for distant sale are not allowed to ripen on the tree. They are gathered when green, and must go through what is called a curing process before they can be placed on the market.

As the lemons are now handled, they are taken from the trees and carried to special establishments, where facilities have betn provided for washing them thoroughly. They are placed by machinery in large vats containing water. In these vats revolving brushes constantly stir the lemons, and the skin in this way is thoroughly scrubbed. A large portion of this work is done by Japanese, who stand over the vats, see that the water is frequently changed, sort the lemons as they are washed, and arrange them in boxes.

Special buildings of large size have been constructed for the reception and curing of the lemons after they are washed. These buildings are, as a rule, so arranged that air will circulate readily and rapidly through them.

The boxes containing the lemons are piled in blocks, each block containing from 500 to 600 boxes. These large blocks of boxes are then covered with huge canvas tents, which are arranged in such a way that the air can circulate under them.

The fruit is allowed to remain under these tents for several months, and during that time it undergoes a process of sweating and curing which reduces the roughness of the skin and also greatly improves its texture. Chemical changes in the fruit also take place, all of which lead to its improvement.

An important question which has not yet been fully worked out in connection with the lemon has to do with its keeping qualities after it is taken from the tents. In this respect the foreign product is to a certain extent superior. Rapid improvements are being made, however, largely owing to the painstaking efforts of the packers.

During the curing process the lemon is subject to many serious diseases or rots. Little is yet known in regard to the causes of these. As a rule, the lemon is shipped without refrigeration. In fact, refrigeration has a tendency to cause decays of various kinds.—"Florida Advocate."

"JULIE" MANGO.

The "Bulletin" of the Trinidad Botanical Department for January contains the following note on this popular variety of mango:—

The mango known as the "Julie" is one of the best, or perhaps the very best, of all the introduced kinds, and is daily gaining in favour, the demand for plants at the Government Experiment Station being larger than for any other kind. Among the reasons for this preference are: (1) Its excellent flavour; (2) keeping qualities; (3) suitability for transport; (4) early bearing; and (5) its ability to produce regular annual crops.

Its flavour recommends it to the majority of consumers, and as it has little or no fibre it is eminently suitable for table use. Probably no mango known keeps good a greater length of time, and its tough skin renders it easy to pack for transit to long distances.

It fruits at a very early age, often commencing at four years from planting, and sometimes earlier. The tree has a dwarf, bushy habit, but in time grows to a large size. The "Julie" is one of the most regular croppers of all the mangoes.

It has been exported to England from Trinidad, and has arrived in first-class condition.

Compared with it, the famous Jamaica No. 11 is "out in the cold," as it can be eaten with a spoon, while the No. 11 is characterised by the large amount of fibre which adheres to the seed. It is a long way superior to the "Peters" or "Malda," and is always found in superior condition to that mango, which has the fatal fault of being frequently sour at the centre.

Altogether, "Julie" takes the first place among the cultivated mangoes of Trinidad, and the trees suffer less from disease than most other kinds. It is certainly a fruit which can be highly recommended for cultivation for export.

ANOTHER GOOD FRUIT FOR QUEENSLAND.

MAMMEE FRUIT.

The "Agricultural News" of Barbados writes:—

Confusion often arises as to the two fruits to which the name "Mammee" is applied. These are the Mammee apple *(Mammea americana)*, and the Mammee sapota *(Lucuma mammosa)*.

The mammee apple, which is related to the mangosteen *(Garcinia mangostana)*, is a native of the West Indies; it belongs to the natural order Guttiferæ.

This is a handsome tree, 40 to 60 feet high, with large, rigid, leathery, shining leaves, and white, scented polygamous flowers. The calyx splits into two, disclosing the four to six petals and the numerous stamens. The fruit is nearly spherical, 3 to 7 inches in diameter, with brown resinous exocarp, and one to four large stones covered with fibre and surrounded by an orange-coloured, sweetish, aromatic pulp. This pulp is eaten raw, stewed, or preserved with sugar. It has something of the taste of the apricot; hence the name "San Domingo apricot." This tree supplies a durable timber which is often sufficiently finely grained for cabinet work. The gum is used in the West Indies for extracting chigos. The spirituous liqueur known as Eau de Créole, is flavoured with a distillation of the scented flowers of this tree. Mammee wine has been prepared from the pulp of the fruit or the sap of the tree.

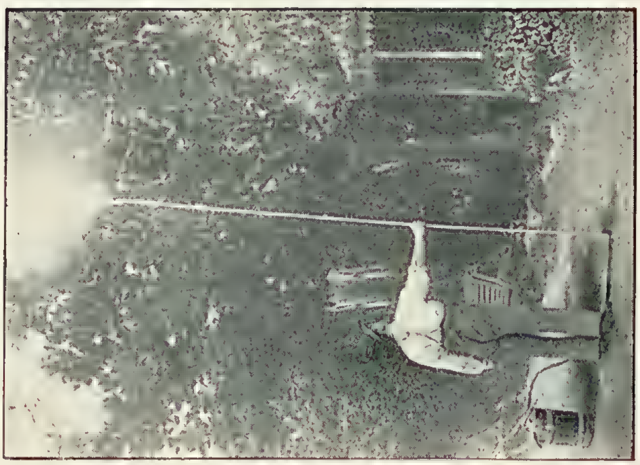
The Mammee sapota, or "marmalade fruit" tree *(Lucuma mammosa)*, known also as sapote, grosse sapote, or sapote à crème, a native of Central America, is related to the sapodilla, belonging to the natural order Sapotaceæ.

This is a tree 30 to 40 feet high, with fulvous or grey branches, papery, long obovate pointed leaves, and brown egg-shaped fruit. Flowers cream-coloured and silky, in clusters of six to twelve on the bare stem. Calyx with

Plate XXIII.

Mammee Apple. (From "The Book of Trinidad.")

Plate XXIV.



SPRAYING FRUIT TREES.

ORDINARY SPRAYING.

THE TYREE SPRAYER AT WORK.

several leaves; corolla tube with five lobes; five staminodes; five stamens; and five-celled ovary. Fruit about 6 inches long, with reddish pulp, and one (or more) polished seeds. The pulp is sweet, and resembles in taste that of a luscious pear. It is made into marmalade which is not unlike good apple preserve. The timber resembles mahogany in colour, is compact, and used in house-building.

The common names of this tree are often confused in the West Indies with those of *Mammea americana,* since the appearance of the two is somewhat similar.

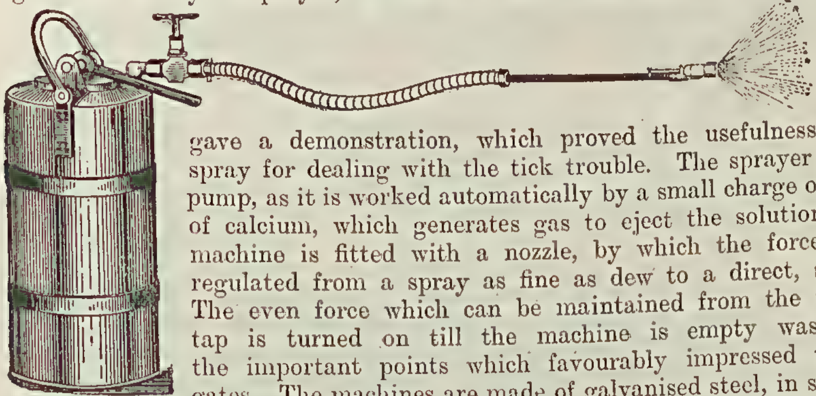
Neither of these fruits seems to have been improved by cultivation, and they both appear to offer promising material for improvement by selection.

A USEFUL SPRAYING MACHINE.

Those who consider the hand-washing of dairy cattle and horses ineffectual in coping with the tick trouble, and others who do not favour dipping, believing that the process not only puts the cow off her regular supply of milk, and in some cases causes injury to the animal, will be glad to note that a very effective spraying machine is now on the market. Owners of horses and cattle who have had their animals sprayed at the Agricultural Department's yard, will have noted how the spray searches out every inch of the beast's body. There is no escape from the fine spray as there applied. But everyone has not the opportunity of employing such an apparatus as is depicted in another part of this Journal. To these, the Tyree Patent Automatic Sprayer will recommend itself as thoroughly effective and, what is greatly to the point, cheap.

There are many points in favour of this sprayer, amongst which are: It is simple, portable, and economic to use; it works without any labour, and does its work effectually.

Before the late Tick Conference assembled on 7th May, the Queensland agents for the Tyree Sprayer, Messrs. Buzacott and Macfarlane, Adelaide street,



gave a demonstration, which proved the usefulness of this spray for dealing with the tick trouble. The sprayer is not a pump, as it is worked automatically by a small charge of carbide of calcium, which generates gas to eject the solution. Each machine is fitted with a nozzle, by which the force can be regulated from a spray as fine as dew to a direct, solid jet. The even force which can be maintained from the time the tap is turned on till the machine is empty was one of the important points which favourably impressed the delegates. The machines are made of galvanised steel, in sizes from 4 to 200 gallons. There is another good and most important point about the machine. Besides being useful for spraying stock, it is admirably adapted for spraying sheep for fly-blow, spraying fruit trees with insecticides, for spraying hospitals and other institutions with disinfectants. We also saw a brick wall perfectly whitewashed by the help of this little machine, which can be put to manifold uses in the field, the orchard, the dairy, and the house.

In using it for whitewashing buildings, the lime must be slacked in a large quantity of water, and allowed to stand for a week. Stir it up, strain it, allow it to settle for a day, then pour off the water. The residue is lime putty. Take about one-third of a kerosene tin of this putty to two-thirds of water. This makes a properly prepared disinfecting whitewash that will not rub off. Any boy can work the machine.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, F.L.S., Colonial Botanist.

ERRATUM.—In the February issue of the Journal (Vol. XVIII., p. 76), the habitat of *Tinospora Berneyi* is given as—The basalt scrubs, Wyangarie. The habitat should have been—Spring Valley, Hughenden.

Order CUCURBITACEÆ.

TRICHOSANTHES, Linn.

T. nervifolia, *Linn.* C. B. Clarke in Hook f. Flora Brit. Ind. III., 609. Tab. 17, Vol. VIII., Rheede Hort. Mal. Stems slender, climbing, the plant almost glabrous, except the young growth and inflorescence. Leaves membranous, cordate-acuminate, pale on the underside, 3-nerved at the base, margin with distant minute teeth, about 3 in. diam. each way; petiole about 1 in. long. Tendrils slender, 2-fid. Flowers diœcious. Male inflorescence pubescent, the flowers not numerous, about as long as the leaves; flowers white; corolla-tube linear, about 1½ in. long, enlarging near the summit, the fringe about 1 in. long. Stamens short, pistodia setiform. Fruit ovoid-oblong, green with white lines, about 2 in. long. Seed semi-ellipsoid, compressed, margins corrugated, about 5 lines long.

Hab.: Scrubs near Herberton, *R. C. Ringrose.* The specimens received were fragmentary; therefore the above is in part from C. B. Clarke l.c. and Cogniaux, De Candolle's Mon. Phan. III., 356.

Order GRAMINEÆ.

TRIBE AGROSTIDEÆ.

ARISTIDA, Linn.

SECTION CHÆTARIA.

A. utilis, *Bail. sp. nov.* Rhizome shortly creeping, not robust, forming dense tufts of very slender stems 3 to 4 ft. high with inflorescence, the lower few internodes only a few inches long and densely villous with weak, longish hairs; nodes nearly or quite glabrous; the last internode or peduncle ½-line diam., very long, glabrous, and of a rather dark glossy yellow. Leaves narrow, 3 to 6 in. long, the apex acuminate; sheath more or less hairy; ligula of very short more or less distinct scales. Panicle slender, from 12 to 15 in. long, the lower branches distant, scarcely spreading; the branchlets and pedicels quite capillary and scabrous. Outer glume 5-nerved, 2nd glume 1-nerved, hyaline, both tapering into awnlike points, and 3 to 4 lines long; flowering glume longer, convolute in the upper part, terminating in a trifid awn or 3 separate awns; the centre one 6 to 8 lines long; the lateral or smaller ones 1½ lines long, glabrous and often purplish; callus hairs about ½-line, white.

Hab.: Near Cooktown, *Mark Webb.* My specimens are still somewhat imperfect; but enough is available to show that the present species is very distinct from other Australian species, and it does not fully agree with others of which I have descriptions. The long smooth peduncles are being used in the manufacture of hats.

Order FUNGI.

Cintractia, *Cornu.* Sacc. Syll. Fung. VII., 480. Spores agglutinate, afterwards free when mature, produced gradually from a compact somewhat gelatinous stroma, which remains for a long time fertile, and given off from the more recent ones externally. A species of this genus was found on a specimen of *Panicum effusum* gathered by Mr. H. Tryon on Percy Islands, December, 1906. The fungus was determined by Mr. Massee, of Royal Gardens, Kew, England.

PUCCINIA, Pers.

P. distincta, *McAlp.* Æcidia seated on discoloured spots, amphigenous, arranged in a circinate manner, or irregularly disposed, and often distributed over the entire surface; pseudoperidia cup-shaped, with reflexed torn margins, about $\frac{1}{4}$ to $\frac{1}{2}$ mm. diam.; peridial cells elongated elliptical to oblong, punctulate all over, $25 - 29 \times 13 - 19\ \mu$. Æcidiospores subglobose to oval or ellipsoid, orange-yellow, very finely echinulate, $14 - 19\ \mu$ diam., or $14 - 20 \times 13 - 16\ \mu$. Teleutosori intermixed with and often surrounding æcidia, brownish-black, oval, $\frac{1}{2}$-1 mm. long, generally confluent, bursting through and surrounded by the leaden-coloured epidermis. Teleutosori chestnut-brown clavate or oblong-clavate, attenuated at base, smooth, constricted at septum, $34 - 50 \times 15 - 21\ \mu$, average $42 \times 17\ \mu$; upper cell generally darker in colour than the lower, rounded and thickened at the apex (up to $9\ \mu$); pedicel persistent, pale-yellow or coloured similarly to lower cell, up to $50\ \mu$ long. Mesospores numerous, elongated clavate to somewhat ovate, chestnut-brown, usually thickened at the apex, $34 - 37 \times 13 - 16\ \mu$.—From McAlpine's "Rusts of Australia," 156.

Hab.: On the leaves and inflorescence of the English daisy growing at Toowong (two-year-old plants).

CERCOSPORA, Fries.

C. Bloxami, *Berk. and Broome.* Spots orbicular, pale; conidia elongate-fusiform, both ends acuminate, multiseptate.

Hab.: On turnip leaves growing at Toowong; the same fungus attacks turnips in Europe.

CONSUMPTION OF BANANAS IN GREAT BRITAIN.

The consumption of bananas in Great Britain has increased enormously of late. In 1906, 7,000,000 bunches were imported from the West Indies, Costa Rica, and the Canary Islands. In an article on the banana industry in the "Agricultural News," of Barbados, commenting upon the paper of Mr. F. Pink on the subject which appeared in the Journal of the Royal Horticultural Society, we find that, in regard to the difficulties of transport, it is remarked that "freight usually costs four or five times as much as cultivation." Bananas are carried to England from the Canary Islands in from five to seven days. As no special facilities are provided for keeping them cool in summer or warm in winter, large quantities are spoiled. The voyage from Barbados takes from eleven to twelve days, and the fruit is brought in holds cooled by powerful fans, and in some of the ships by refrigerating machinery. "As the temperature of the holds must not go above 70 degs. Fahr. for any length of time, nor below 55 degs. Fahr. at all, it can easily be seen that the question of transport is a difficult one." From Jamaica the voyage takes about twelve to fourteen days, and from Costa Rica three days longer; the bunches are carried upacked in special chambers cooled by refrigerating machinery of the latest type. The specially fitted steamers can bring from 35,000 to 45,000 bunches on each voyage.

Apiculture.

FOR BOYS AND GIRLS.

BEES.

In the course of a very interesting and instructive paper on "Bees," which appears in the "New Zealand Baptist" for April, the Rev. J. J. North, of Wellington, addresses the following remarks to the boy and girl readers of that paper:—

"There is a good deal about bees in the Bible. The Jews were told that their new home flowed with honey. So Palestine does. Wild bees swarm everywhere in that land of flowers. You remember how Samson found that they had hived in the skull of the lion he killed. In the Jordan Valley fierce tribes of bees build their combs in the rocks. John Baptist must have got many a bee-sting when he hunted for his supper. Honey, which you all like very much, used to be far more important than it is now. For thousands of years it was the only sugar that people knew about, and even yet in Hungary and Russia thousands of tons of honey-sugar are produced every year. How hard the bees work, and how many a boy, before the sugar-cane came in, blessed them when he ate his porridge!

"During the last hundred years people's interest in bees has been growing keener and keener. So many new things have been found out about them. People were content to eat honey without knowing very much about it. The bees were so small, too, and lived in such dark houses, that it was not easy to find out about them. Now, would you believe it, the man who first found out very much about them was a blind man who had not seen bees since he was a boy? What I am teling you is one of the strangest of true things. Francois Huber was born in Geneva, and, when quite a lad, became blind. A description of the experiments of Reaumur interested him, and he thought a great deal about the little children of the sun. Presently he got a very sharp servant named Burnens. He set Burnens watching bees, and listened intently to all Burnens saw, told him what to look for, suggested experiments, and dug out all the great secrets of the bee-hive. Men say now that it is far easier to tell what the blind man did not find out than what he did. Is not that wonderful? Ought it not to fill us with courage?

"Now, I shall be content to-day to tell you one beautiful thing which the bee does. We shall enter his palace with a great deal more zest when we fix this in our minds. Everyone knows that the bee goes to flowers. He does not go for fun. He goes for business reasons. The flower gives him two things that he wants—honey and bee-bread. He dips his tongue in the honey vat and catches bee-bread on his thighs. Each flower gives him a very tiny drop of honey. It takes 3,500,000 red clover flowers to give 1 lb. of honey. A bee has to go to 90 to 100 flowers before his honey bag is full once. Long before his honey bag is full, the bee's legs are covered with a golden mass of bee-bread. Indeed, he gets the bee-bread far more readily than he gets his honey, and he drops a great deal of it on the way. Here comes in the wonderful thing I want to tell you. Flowers want bee-bread rather more than bees do. The curious thing is, that they want not their own bee-bread, but another flower's. The other name of bee-bread is pollen, and it lies on the stamen of flowers. Flowers cannot grow seed till pollen from other flowers falls on their pistil. When the bee flies in and plunges his long tongue in the honey vat some of the pollen on his laden thighs, which he has gathered from the other flowers, drops off. Then the flower is very glad and very tired. It shuts up its petals, and they wither away, and presently a dry seed case, from which next year's flowers will come, is all that is left of the summer. In Scotland the moors are purple with heather. On the Alps the gentian flower

spreads out its lakes of blue. On the Himalayas the crimson rhododendron gleams. The bee did it all. The 'thank you' he gave to the flower when he filled his bag with its honey enabled the flower to seed, and so filled the world with new flowers.

"Now, there are wasps, which saw a hole into the honey vat of flowers, and suck the honey without giving the flower the 'thank you' it wants in the shape of bee-bread. Do you know, if bees lost their manners, if they forgot to say 'thank you' to the flowers, and became as short and rude as wasps are, the only flowers left in the world would be green, and even Irishmen would be tired of green then, I suppose. Now, think on this fact. You get honey from many a place; mind you say as handsome a 'thank you' as the bee does. There is a very rich and sweet honey which you get from your home. Don't be a wasp-child, and forget your 'thank you.' Leave in your home your gratitude, your love, your service."

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.									1907.			
	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.
North.													
Bowen	0·78	6·34	0·69	0·04	0·36	3·41	1·76	0·99	11·01	2·53	3·74	1·97	0·39
Cairns	5·20	4·04	3·44	2·28	1·79	1·57	0·56	13·26	11·31	18·36	11·49	3·26	3·35
Geraldton	11·51	7·93	16·05	5·73	6·65	4·26	2·28	21·08	21·20	29·58	25·26	4·58	6·08
Herberton	1·25	1·38	1·04	0·59	0·55	0·38	0·30	5·16	10·82	10·56	11·77	2·05	0·90
Hughenden	0·12	Nil	Nil	Nil	Nil	0·92	0·61	0·51	4·76	1·98	3·83	1·17	0·16
Kamerunga State Nurs.	4·94	4·13	3·55	2·49	2·03	2·56	0·72	10·00	8·17	15·78	14·82	4·87	2·80
Longreach	Nil	0·22	Nil	0·11	Nil	4·11	2·16	0·66	0·51	1·22	0·49	1·88	0·85
Lucinda	10·12	3·77	3·02	0·40	...	Nil	1·85	6·60	*22·36	12·38	23·82	4·53	*3·82
Mackay	2·87	11·87	3·85	0·68	0·93	4·35	2·63	1·80	12·93	2·72	6·42	8·01	1·58
Rockhampton	Nil	5·27	1·12	Nil	2·61	3·80	1·07	0·46	5·19	4·15	4·42	3·05	0·44
Townsville	0·38	1·80	0·30	Nil	0·46	3·25	1·45	7·74	14·03	12·49	7·75	7·37	1·03
South.													
Barcaldine	Nil	1·70	0·19	0·10	Nil	2·88	2·92	1·33	1·04	3·44	0·43	1·51	0·86
Beenleigh	0·04	3·57	1·47	0·16	2·94	3·47	2·94	1·75	3·98	4·75	3·88	4·17	0·58
Biggenden State Farm	0·45	5·77	1·42	0·48	3·02	5·07	1·19	3·09	4·55	5·77	3·55	*12·91	0·34
Blackall	Nil	1·75	0·22	0·48	0·02	4·70	5·86	1·37	1·96	2·30	Nil	2·78	1·69
Brisbane	0·45	3·23	1·38	0·22	4·21	3·48	3·81	1·07	3·28	2·69	5·23	5·32	0·45
Bundaberg	1·17	8·44	2·01	0·03	1·86	10·90	1·57	0·97	3·85	3·29	3·90	12·81	0·38
Caboolture	0·49	4·53	0·85	0·29	3·02	4·77	4·73	4·26	3·15	2·53	8·03	*9·04	0·78
Charleville	0·07	0.85	0·13	2·34	0·35	4·99	2·66	1·30	3·71	0·85	Nil	2·75	2·29
Dalby	1·81	0·66	0·87	1·58	2·78	2·65	2·96	2·12	5·67	5·60	1·34	3·72	0·20
Emerald	0·08	2·12	0·17	Nil	1·62	4·47	1·55	2·32	1·79	7·36	3·67	7·66	Nil
Esk	1·74	3·25	0·77	0·38	4·51	4·14	2·90	2·45	5·26	2·87	6·79	3·60	0·22
Gatton Agric. College	1·40	1·90	0·60	0·41	3·73	3·54	2·25	2·01	3·45	2·62	6·44	2·71	Nil
Gayndah	0·51	5·10	0·48	0·22	2·34	5·14	2·25	4·25	2·82	3·00	1·91	6·89	Nil
Gindie State Farm ...	Nil	2·32	0·05	Nil	1·46	4·57	3·20	2·95	1·45	4·58	0·71	10·10	Nil
Goondiwindi	0·37	2·80	0·98	0·49	4·35	3·33	2·36	2·32	4·04	5·37	1·77	6·51	0·33
Gympie	0·45	6·88	2·26	0·52	3·19	3·97	3·03	4·12	5·32	3·99	6·96	8·93	1·12
Ipswich	0·12	1·67	0·25	0·17	2·59	2·94	2·60	0·71	4·22	2·17	5·38	1·95	0·12
Laidley	0·35	2·83	0·49	0·50	3·26	3·19	2·87	1·78	4·12	2·84	4·50	3·47	Nil
Maryborough	1·08	4·85	2·55	0·15	2·31	6·48	1·22	2·49	4·39	5·44	7·84	10·28	1·25
Nambour	1·13	6·20	3·68	0·61	4·52	8·94	4·89	3·40	6·74	5·74	12·05	13·30	1·36
Nerang	0·87	10·32	1·98	0·12	3·56	6·42	8·26	2·75	6·33	9·86	6·04	7·83	1·48
Roma	Nil	1·09	1·08	1·65	1·47	4·43	2·37	1·32	4·31	6·32	2·92	1·87	0·42
Stanthorpe	2·00	0·77	0·45	1·44	3·37	4·29	2·90	2·49	4·89	4·33	3·30	5·98	1·68
Tambo	Nil	0·66	0·05	0·67	0·07	5·17	2·85	1·23	1·16	4·74	1·41	3·58	3·69
Taroom	0·23	1·04	0·81	0·60	2·30	4·26	1·70	1·35	5·49	5·16	1·10	1·86	Nil
Tewantin	2·27	4·61	5·68	0·39	4·25	6·37	4·38	2·73	9·53	6·38	15·83	11·45	1·87
Texas	1·89	1·57	0·75	0·90	3·22	2·77	3·42	2·23	1·83	4·69	4·55	6·16	0·65
Toowoomba	2·07	2·65	0·85	1·81	3·63	4·55	2·76	2·65	4·11	3·94	4·00	4·81	0·01
Warwick	0·37	0·77	0·57	1·16	3·85	3·13	2·47	2·99	5·50	3·95	2·52	5·71	0·51
Westbrook	0·39	0·50	0·55	1·67	2·80	3·34	3·41	1·79	1·48	1·79	2·91	5·13	0·02

* Compiled from telegraphic reports.

GEORGE G. BOND,
For the Hydraulic Engineer.

Tropical Industries.

CIGAR LEAF IN NORTH QUEENSLAND.

By R. S. NEVILL.

During my visits to Northern Queensland, I have examined carefully much of the soil, and am of the opinion that a great deal of the land is suitable for tobacco-growing. More especially is the land from St. Lawrence to Mackay, about Bowen, and on the Lower Proserpine, especially on Kelsey Creek, very desirable for the purpose. On the Murray River, inland from Cardwell, the land is well suited for tobacco, and thence northward as far as Cairns.

As the climate has quite as much to do with the production of good tobacco as the soil, *we cannot fully determine* whether or not these factors will produce a superior quality until the experiment has been tried. It HAS been tried in a very small way at the Proserpine and on the Murray, and *the results were most satisfactory*, sufficiently so to demonstrate that those who will take up tobacco-growing in these two districts, and who are careful and painstaking, will get satisfactory results. The experiment is certainly worth trying, and those who are first in the field to make a success of it will be richly rewarded for their labour.

Good cigar tobaccos have always been scarce, and fetch high prices in the world's great markets—prices that will justify hiring labour for the work.

The Dutch company that began tobacco-growing in Sumatra, in the early sixties, have averaged 75 per cent. dividends annually from the beginning, besides adding to the value of their holdings over 500 per cent., without additional calls upon the stockholders. It is true this has been done with cheap labour, but these immense profits leave a margin of good profits for ordinary labour. There has been no market in Queensland for cigar tobacco for a number of years, but Sydney and Melbourne are large buyers of cigar leaf, and if a superior leaf is grown here a market can be found for it; but intending growers should remember that buyers want good tobacco—the world is full of worthless stuff, and to make it good requires care and faithful attention to every detail.

For the information of those who may desire to try the experiment, a few suggestions for their guidance will be of assistance, and I will state that nothing is hereinafter written but what is important, and should be carefully noted and followed, for failure is almost sure to result if the instructions are not fully adhered to in every particular.

To grow tobacco successfully and profitably cannot be done in a haphazard way, and those who attempt to grow in such a way must meet with disappointment and loss; on the other hand, tobacco is one of the most profitable crops grown if properly looked after.

Some things can be done in almost any fashion, but tobacco-growing is not one of them.

SOILS.

The soil should be a warm, sandy alluvial one, well drained, and rich in humus or vegetable matter—a soil that is friable and capable of the finest tilth, and such a one as will retain its moisture. The content of clay should be small, or absent almost altogether, though a clay subsoil is not objectionable, but clay in the soil tends to make the leaves thick and gummy, which is objectionable in cigar leaf. The land to be planted should be at least 5 miles from the sea coast, that it may not be effected by the sea air, which injures its burning quality.

The ground should be well and deeply ploughed, and cross-ploughed, brought to as great a fineness as possible, and should be kept clean. Cloddy ground will grow tobacco, but it will not have so good a flavour or texture as when the soil is thoroughly pulverised.

WHEN TO PLANT.

It is best to plant at a time when the harvesting will come on at the end of the rainy season as near as may be, and, in order to determine that, it must be remembered that it will take from six to eight weeks from time of sowing the seed until the plants are large enough to transplant. This is the usual time, though sometimes, under favourable conditions, one month is sufficient. After transplanting, when the plants have taken root, they will take from sixty to seventy-five days to mature.

The reasons for harvesting at the time mentioned are—that it is desirable to have the plant growing at a season when there is a humid atmosphere, which greatly improves the texture of the leaf, and that it is not desirable to have the hot drying winds while the tobacco is curing, as it will then be subject to changing conditions that make it green and splotchy, and the leaf is liable to be harsh and dry, whereas it should be soft and flexible.

Tobacco should never be hung in open sheds, but in closed-in, well-ventilated ones; neither should it be exposed to hard drying winds, either in sheds or fields; hence fields should be as much sheltered as possible.

Sheds should be built so as to prevent too rapid changes in the temperature, and so that the temperature will not get too high and cause too rapid drying; hence, iron for roofing or sides is very objectionable. A good thatched or board roof should be used, and for the sides the same material, so arranged as to be able to ventilate freely when required.

MAKING SEED BEDS.

Seed beds should be sown, and the plants transplanted to the field, just as is done with cabbage. After clearing the soil of any timber growth and before stirring the soil, wood, bark, and leaves should be placed on the land and set fire to. The ground should be burned sufficiently to destroy all weed seeds, grass roots, &c. The reasons for this are several. It destroys weeds and grass, and no weeding of the beds will be necessary, and this saves much time and labour; the ashes serve as a good fertiliser, and the small bits of charcoal greatly conserve the warmth of the bed. After the ground has cooled, rake off any *débris* that may be left unburnt, but leave the ashes on. Dig the bed well to the depth of 6 or 7 inches, taking care to reverse the soil; work and rake it until you have made as fine as possible.

Virgin soil is the best for seed beds, and should not be on low-lying, wet, or foggy flats; the land should be convenient to water, that the plants may be watered when needed. If the beds are made on low, damp, or foggy flats they will be more liable to disease.

SOWING SEED BEDS.

The quantity of seed to be sown is about a teaspoonful to a bed 5 by 20 feet or 100 square feet. The day before sowing put the seeds into a glass of water, and let them stand for two or three hours. By that time, all the seeds of strong vitality will have settled to the bottom of the glass; those left floating on top are either sterile or of such low vitality as to produce only weakling plants. Pour off the water, and take only the seeds left in the bottom of the glass. Dry them in the sun or near the fire; then mix them with ashes or lime thoroughly, and sow evenly over the bed. In drying seeds after taking from the water, only a few minutes are necessary to get the dampness off them that they may not stick together when mixing with the ashes or lime. *After sowing the seed, do not rake or tramp it in, but take a sprinkler and sprinkle water well,*

carefully, and evenly over the bed, not allowing the water to run in little streams on the surface, as this disturbs the position of the seed and makes the plants thick and thin in the bed. As the water soaks in, go over the bed again and again, until it is well watered. This will give a sufficient covering of earth to the seed.

Do not wait for rainy or seasonable weather for sowing your beds, but sow in time to have plants ready for transplanting when the seasonable weather begins.

This you can do by watering your beds regularly as described under the section "Treatment of Seed Beds."

Do not sow all your beds at one time, but sow one or two beds every week or ten days, so that you will have plants coming on at different times, which gives you more time for getting out your crop. Sow plenty of beds, so as to have plenty of plants. Be careful to sow evenly over the bed.

TREATMENT OF SEED BEDS.

After sowing, the beds should be covered. Butter cloth or calico is best; but, in the absence of these, grass can be used. *This covering is necessary, as the hot sun will kill the plants as they sprout, or "in the crook,"* as the Yankees say.

As the plants begin to grow, they should be gradually hardened by removing the covering each day for awhile, making the time longer each day until they are left entirely uncovered for a week before transplanting. *If the weather is dry, the beds should be watered at least every other day, late in the afternoon, until the plants come up, which may be a week or it may be two weeks, owing to the season.*

If the sun is very hot, a good covering of grass laid flat on the ground is the better plan until the plants are up; and, as they begin to grow, this covering should be thinned, but the grass covering need not be removed when the plants are watered.

After the plants are well up, water as they need it, but not too much, or they will grow up thin and sappy, and will not stand transplanting so well. Before sowing the seed, it is a good plan to sow about one-eighth of an inch of sand over the bed. This prevents the ground cementing so badly when the plants are being watered. When they have developed four to six leaves, care should be taken not to water too much, or "blue mould" may develop on the plants. They should only have enough water to keep them healthy. A slow-growing plant in the bed, if healthy, is usually hardy. Thin out the plants if they are too thick in the bed; also pull up any weeds that may appear in the beds, but if the beds are well burned you will not be troubled with them.

TRANSPLANTING.

This should be done late in the afternoon. The rows should be 3 feet 6 inches apart, and the plants placed 18 to 22 inches apart in the rows. Select strong healthy plants with good lengthy stocks, and set them well down in the earth, pressing the dirt well to the roots. By having long stocks and setting the plant deep, the roots rest in the moist earth and will thrive better. In drawing the plants from the seed beds, it is best to take a three-tined steel table fork and raise the plant with it. This leaves a good bunch of earth clinging to the roots, and enables the plant to take root better. *Transplanting should be done after rain, or in cloudy weather, as much as possible; but if the weather be dry, water should be used to set the earth about the plant, and early next morning a light covering of grass should be put over each plant before the sun is up. If the weather continues dry for some days, it will be necessary to water the plants occasionally until they take root. This can be done by using a bucket of water and a cup. Pour about a pint over each plant. This should be done about sundown; it is not necessary to remove the grass covering when watering.*

In setting the plant, scoop out with the hand some of the earth so as to make a depression around the plant. This serves to keep the water from running away from the plant, and also, when the grass covering is laid over it, it will not press it down. The depression should be made deep enough to leave the plant standing erect when the covering is put over it.

Cultivation.

Clean cultivation is necessary. After the plants have taken root, the field should be gone over with a hoe, the earth loosened about the plants, and the weeds chopped out. When the plants are 3 or 4 inches high, a Planet Junior with the small points should be run between the rows. The Planet Junior should be well opened out, and run as close to the plant as possible without cutting it up, and it should be run to its full depth to form a loose root bed that the roots may run and not be dwarfed.

This ploughing should be done every ten days, but not run so close to the plant nor ploughed deeply until the plants are 12 or 15 inches high. Then a pony turning-plough with one horse should be used for hilling up. When this is being done, the plough should not run closer to the plant than a foot.

The tobacco should be kept free from grubs. The time to look for these is early in the morning. Later on come the topping and priming, which should be done promptly when the time arrives. Topping is pinching out the seed bud, and priming is breaking off three or four bottom leaves to let the air circulate under the plant. Topping and priming should be done at the same time; and after this is done, there should still remain on the plant eighteen or twenty leaves.

Do not let your plants flower, except such as you want for seed. After topping, suckers will shoot up from the base of the plant and where each leaf joins the stalk. These should be kept broken off, and not allowed to grow to any size. Suckers will have to be taken off two or three times before the crop ripens.

Harvesting.

Tobacco should not be cut until fully ripe, but it should not be allowed to get over-ripe. It is ripe when the leaf begins to droop, and shows a rough surface and brown spots appearing on it. In the early morning, if the ripe leaf is folded it will split along the fold. Cutting should not be done in the heat of the day if the weather is hot.

The stalk should be split to within 6 or 8 inches of the ground, and then cut off at the ground, gently laid down with the butt towards the sun. Let it lie until it is thoroughly wilted, which will take from thirty minutes to an hour, according to the weather. After it has wilted, hang it astride a stick. Other methods of harvesting are practised, such as spearing the stalk, also gathering the leaves and stringing them; but the above is the simplest to beginners. In hanging on the stick, each plant should occupy a space of at least 6 inches to prevent crowding—that is, fully 6 inches between the plants.

For convenience, a scaffold can be erected on the field, and the sticks of tobacco hung on it for two or three days until thoroughly wilted; but it is better to take it to the shed if convenient to do so, and hang it on the lower tiers; but, if a scaffold is necessary, it should be made under the shade of a tree, so that the *hot* sun will not shine on it. Care should be taken that no rain falls on it after it is cut. Tobacco should never be cut when wet from either dew or rain, and after a good rain should not be cut for three or four days, unless it is already fully ripe.

When taken to the shed, the sticks must not be hung too close together, but so placed that the tobacco on one stick barely touches the tobacco on

another. It should be opened out well on the sticks. If this care is not taken, it may house-burn and stem-rot, either of which mishap destroys its value.

After hanging in the shed, give plenty of ventilation for the first two or three weeks, but protection from hard winds must be afforded. After this time so much ventilation is not needed, but it is not advisable to have the shed too close.

In curing tobacco the conditions should be as uniform as possible, or any changes should be very gradual.

Fire should not be used in curing cigar tobacco, except when the weather continues wet and it is likely to be damaged, and then only for an hour or two at a time; then stoves should be used for drying-out the shed, but the pipes should run outside and no smoke allowed to get on to the tobacco; or charcoal pans may be set on the floor after the smoke has burned off.

SELECTING SEED PLANTS.

In saving seed, care should be taken in selecting plants that are strong, and that each seed plant should show the same characteristics. By this is meant same shaped leaves, equal distance on the stalk, growing in the same position, &c., &c. This is necessary if you are to keep the type, and this you will understand when it is noted that when tobacco seed is introduced into a different locality its tendency is to break up into various types, and eventually to establish a type that would naturally be peculiar to the country; hence, by carefully selecting a type for a few years, we are enabled to fix it. It is a good plan to save enough seed one year to last for three or four years. By this means you do not get away from the original so readily, if a mistake is made in selecting the seed plants. When the plant seeds, allow only one head to run up, cut off all branching heads, so as to allow only fifteen or twenty seed pods to form on the central spike. By this means the whole growing strength of the plant is thrown to these few pods, and strong healthy seed is formed. This is important.

Do not strip the leaves from the seed plant until the seed has fully matured. When the seed has matured, cut the stalk off 5 or 6 inches below the seed pods, and hang head down in a dry place until the pods are thoroughly dry.

The cigar-leaf industry is a valuable one, and, if once developed in this State, will be found to be exceedingly valuable to the small grower, especially to those farmers who are at some distance from shipping points and have to haul their produce considerable distances. To such farmers I especially commend the crop; at the same time it is a profitable crop to all farmers when a high-grade leaf can be produced, and I feel satisfied that a high-grade leaf can be produced in the districts I have mentioned; and it is sincerely to be hoped that the effort will be made by some of the farmers in these districts with the view of growing it commercially as a regular crop, and not as a curious experiment.

Intending growers can secure suitable seed from the Department of Agriculture and Stock at 2s. per oz. Address the Under Secretary. Always state whether cigar or pipe tobacco seed is desired.

Pipe varieties—Lacks; Yellow Pryor.

Cigar varieties—Zimmer Spanish; Sumatra.

TRAP CROPS FOR THE PROTECTION OF COTTON PLANTS.

The following notes from Bulletins 33 and 50 of the United States Department of Agriculture conclude the series begun in our last (April) number:—

In the intelligent handling of trap crops, the cotton planter will find by far

the most efficacious preventive of boll-worm damage. This suggestion is an old one. It was proposed by Morsby in 1855; by E. Sanderson in 1858; and by Peyton King in 1885; it was recommended by Comstock, after careful preliminary observations by Trelease, in 1879; and Riley in 1885 gives it at least equal as a remedy with poisoning. The complete development of the trap-crop system, however, rests upon the studies and recommedations made by Mally; and S. B. Mullen, of Harrisville, Miss., has written in a most practical manner relative to corn. Mally's recommendations are, in brief, when planting cotton leave vacant strips of five rows for every twenty-five of cotton. In these five rows, at the earliest possible time, plant one row with an early-maturing sweet corn. It should not be drilled in too thickly, as a minimum number of plants and ears is desired. During the silking period frequent careful examinations must be made as to the number of boll-worm eggs. As soon as no more fresh white eggs are found each morning, the silk ends of the corn should be cut away and burnt or fed to stock, in order to destroy the young worms and the eggs. A few eggs may also be found upon the leaves of the plants, and, since no more growth is to be made, the plants should be cut and destroyed. Then three more of the rows should be planted to dent corn at such a time as to bring the silking period about the 1st of July or a little later. Upon these rows very large numbers of eggs will be laid, but they should be allowed to mature in order that the natural enemies which parasitise the eggs and prey upon the larvæ may not be destroyed. The crowded condition of the worms in the ears developed in these three rows will induce cannibalism to such an extent that the number of worms reaching maturity will be reduced to the minimum, and these can well be allowed to escape if the natural enemies are saved thereby. To trap these escaping individuals, however, the fifth and last row of the vacant strips should be planted to sweet corn at a time which will allow it to reach full silk about 1st August, since the majority of the moths begin issuing again about that time. This last row should be carefully watched, and the corn should be cut and destroyed as soon as it appears that no more eggs are being deposited. Mr. Mally found that the corn produced by the second planting is likely to be large enough in quantity to pay for expense of cultivation and the sacrifice made by cropping the five rows in corn instead of cotton. Moreover, he thinks that if the first two plantings are well managed a number of the earlier broods of the boll worm will be so reduced that the August brood will not be capable of inflicting great injury, and, therefore, in the less infested regions the third planting may be dispensed with. He further found that it was not necessary to crop the entire plantation with this five to twenty-five rows of corn to cotton. If 5 acres be planted in this way for every 50 acres of cotton, or even 5 acres of trap alternate for 75 or 100 acres, the crop of the entire plantation may be protected.

CANNIBALISM.

The difference in mortality on corn and cotton is mainly due to the cannibalistic habits of the larvæ themselves. When young, this habit does not manifest itself very strongly, unless the boll worms are pressed for food, but after they are half-grown or large they become extremely vicious and attack one another on the slightest provocation. If two larvæ are feeding in one ear of corn and their paths accidentally cross, they become irritated at once and snap at each other with the mandibles. Usually the larger one is victor, and makes a meal of the smaller. If, as is sometimes the case, both are of approximately the same size, it is not unusual for both to be so injured as to die.

Even two larvæ peaceably crawling about will almost always fight if they come together unexpectedly. They do not evince any desire to hunt out their fellows, however, and it appears to be merely chance that brings them into contact. Observers have often been inclined to think that cannibalism was

induced by external annoyances caused by ants or insects, but this does not seem probable. It seems to be simply an inherent instinct. The boll worms appear to relish the bodies of their unfortunate fellows, but soon sicken and die if compelled to subsist for a long time on this sort of food. Several were experimented on in the laboratory by feeding them on crushed caterpillars, but none so fed matured successfully.

This is one of the most valuable factors in reducing the injury to corn, for if all the larvæ in an ear should feed peaceably together, as is usual among many other species of caterpillars, they would no doubt often consume it entirely. This would mean in certain regions an almost complete destruction of the corn crop.

During August, 1904, an actual count was made of the number of young ears, to ascertain the number of larvæ present. In ten ears there were in all 168 larvæ, each containing from 8 to 38 in all stages of development, although mostly quite small. This is an average of nearly 17 to an ear, or over eight times the number which could eventually mature.

Cannibalism is not so important in lessening injury to cotton, since the larvæ are more isolated, and do not meet one another so often. During seasons of bad boll-worm injury, however, it may be an appreciable factor in their reduction.

Aside from eating larvæ and pupæ of its species, the large boll worms will often feed extensively upon the larvæ and pupæ of the cotton caterpillar late in the fall, when the latter is abundant, as well as upon other species.

TRANSPORT OF PARA RUBBER SEEDS.

The report of Department of Public Gardens and Plantations of Jamaica for 1905-6 contains an account of the results of importations into Jamaica. The report says:—

A consignment of 7,500 seeds, packed with incinerator earth and sawdust in biscuit tins, was forwarded from Singapore by parcel post on 31st August, and arrived in Jamaica on 25th October, 1905. Forty-five seeds were rotten when received; 7,455 seeds were sown, and of these 6,506 germinated, or 87 per cent. Of the 6,506 plants potted, 1,435 were constitutionally weak and died soon after potting. There were thus obtained 5,071 plants, or about 68 per cent. of the number of seeds sown.

On 30th January, 1906, 725 seeds were received from Para. They were packed in powdered charcoal, and only fifteen were bad on arrival. From the 710 seeds sown, 656 plants were raised, or about 90 per cent.

It does not appear to make any difference what the packing material may be so long as it is dry. Sifted dry earth is, perhaps, the best material to recommend, as it is always possible to obtain it.

THE POISON OF CASSAVA.

The following notes are taken from a paper by Messrs. Dunstan, Henry, and Auld on Cyanogenesis in Plants, Part V., published in the "Proceedings of the Royal Society," B., Vol. 78, 1906:—

The many varieties of cultivated cassava are regarded as belonging either to the bitter species, *Manihot utilissima*, or to the sweet species, *Manihot Aipi.*

When cultivated beyond the tropical zone, they become much less poisonous. In A.D. 1764, there is an account of 50 lb. of cassava juice being distilled; 3 oz. of distillate were obtained, and thirty-five drops of this killed a man at once.

Analyses by Francis and by Carmody show that in the West Indies the bitter cassava has the hydrocyanic acid distributed throughout the root, while in the sweet cassava the poisonous principle is chiefly in the rind.

Bitter cassava root sliced and dried yielded from the root 0·009 per cent., and from the rind 0·035 per cent. of hydrocyanic acid. The glucoside, by the decomposition of which the hydrocyanic acid arose, was isolated by alcohol and ether, and was determined to be identical with phaseolunatin from Lima bean seeds. It gave off, when hydrolysed, acetone and hydrocyanic acid. A chloroform extract of the cassava root, precipitated with alcohol, yielded an impure enzyme, which readily decomposed amygdalin and phaseolunatin.

Mr. A. C. English, a late magistrate in New Guinea, who is at present in Brisbane, is the owner of a large sisal hemp, rubber, and cocoanut plantation in the Possession. He planted an area of cassava, intending it for native food. Unfortunately, about twenty of his boys partook of the cassava tubers, imperfectly cooked, with the result that he with difficulty saved their lives, and one boy actually died. He decided to give up cassava growing.

MEXICAN HENEQUEN (SISAL) EXPORTS.

Consul-General A. L. M. Gottschalk, of Mexico City, states that interesting statistics of henequen exports of Mexico have recently been published.

They show a decided increase over the previous years' henequen trade; in fact, an increase over the exports of any year since 1902, save that of 1904. The exports in bales in 1902 amounted to 528,246; in 1903, to 611,949; in 1904, to 627,700; in 1905, to 617,766; and in 1906, to 629,785. The sisal or henequen trade of Mexico, which is confined to Yucatan, shows that the two great ports of the district, Progreso and Campeche, were unusually busy during 1906, exporting a total of 626,785 bales, of which 595,024 went to the United States. The only other country taking a considerable number was Canada, which purchased 22,196 bales, while Cuba took 5,777 and England 1,719 bales. Other European countries purchased small quantities.

Various American ports received henequen shipments from Yucatan as follows during the year:—New Orleans, 186,747 bales; Boston, 144,916; New York, 119,688; Texas City, 63,620; Mobile, 59,235; and Galveston, 20,818 bales.

RATHER SMART SPARROWS.

A gentleman bought a lot of chickens and commenced feeding them on rice, but could not make out what they did with the large quantities that were thrown down to them. He determined to watch. No sooner had the rice been scattered over the ground than a cloud of sparrows swooped down and made a splendid meal. There was one consolation, and that was the chickens would soon be "fowl" enough to eat Indian corn. Next morning came, and he threw down corn, thinking he would be one in front of the sparrows, but no such luck. They came as usual, and picking up the corn flew away with it to a railway, placed it on the rails, perched on the telegraph wires, and waited for a train to come by and smash it! He has since given up keeping fowls for profit. This is not a Yankee yarn; it comes from Birmingham.—"American Fancier."

Animal Pathology.

CONTAGIOUS ABORTION IN CATTLE.

(Slipping Calf or "Slinking.")

We take the following paper on contagious abortion in cattle from a series of interesting articles on diseases of farm animals which appeared in 1906 in the "Journal of Agriculture of Victoria" from the pen of S. S. Cameron, M.R.C.V.S.:—

Abortion, by which is meant the birth of the calf at any stage of development prior to the mature period of gestation, may occur as a result of accidental incidence of external forces, or may be directly due to contagion. It is true that any of the usual causes of accidental abortion may co-operate with the contagious element, and so increase the severity of the outbreak, and it is doubtless equally true that the occurrence of accidental abortion may be the starting point of an outbreak of contagious abortion; but, as a rule, the two forms can be sharply defined by inquiry into the surroundings and history of the case. That they should be so defined is of great practical importance; otherwise, through neglect of precautions which are necessary in the one case, but immaterial in the other, a ruinous disease may gain so strong a hold of the herd as to involve great cost and inconvenience in its eradication.

Accidental Abortion.

Amongst the causes of accidental abortion, the following may be enumerated:—Mechanical injuries which result in the death of the unborn calf (fœtus), and its detachment from the membranes of the womb, such injuries, for example, as are sustained through fence-jumping, being kicked or crushed in trucks, races, yards, or otherwise, hounding with dogs, jumping of other cows when "bulling," over-driving, and the like forms of external violence; ergotised grasses, smut, and bunt, or other forms of mould growth on fodder; fermentescible foods, such as clover, lucerne, and sorghum, eaten in immoderate quantities, and so causing "hoven" and bowel disturbance; foul, putrescent drinking water; the eating of frozen foods or the drinking of ice-cold water; severe constipation or bowel disturbance, or the administration of powerful purgatives, all causing excessive straining; the eating of irritant plants, such as savin, rue, and tansy; mental excitement, such as is caused by the sight or smell of blood, carrion, or other strange and terrorising objects; and, finally, many constitutional diseases, cows affected with pleuro-pneumonia or other disease accompanied by high fever being very liable to abort.

The precautions to be adopted after accidental abortion from any of the above causes are: First, the isolation of the aborted animal from other in-calf cows for a period of a fortnight, or until all discharge has ceased, and the womb and genital passages have regained their normal condition. An aborted cow should not be bulled for at least three months after abortion. Second, the burning of the discharged fœtus and "cleansing" of fœtal membranes, and the daily burning of any clots or discharges that are passed. The cow may be given a laxative drench composed of 12 oz. of Epsom salts, 2 oz. of sulphur, and 1 oz. of ginger in a quart of warm gruel; and, as local treatment, the womb should be syringed out two or three times at daily intervals, or oftener, and for a longer period if the discharge is foul-smelling, with a luke-warm antiseptic solution, say, 1 tablespoonful of Creolin or Lysol or Jeyes' Fluid to 2 quarts of blood-warm water.

CONTAGIOUS ABORTION.

This may be defined as a disease of the womb—an infectious catarrh of the lining of the womb (uterus), resulting in the premature expulsion of the fœtus, and caused by the transmission from one animal to another of the specific germ of the disease. When introduced into a herd, the disease assumes the character of an outbreak or epizootic. It is usually so introduced by a cow or bull from a herd in which the disease exists, and the chance of getting the complaint is one of the risks of buying cattle from unknown sources at sale-yards and auctions; or it may be introduced by sending a cow from a healthy herd to a bull that has previously served aborting cows, or by grazing cows in a paddock in which others have aborted, or by any cattle traffic between an aborting herd and sound cattle. The infecting material is present in the discharges, and smears on the tail and quarters, and it may be conveyed by contact with infected bails, fences, rubbing posts, litter, attendant's clothing, or other such means. The disease has been repeatedly conveyed experimentally by inserting into the vagina of a healthy in-calf cow a small piece of cotton wool smeared with the discharge from an aborted cow, or which had been previously inserted for a few minutes into the vagina of such a cow. Moreover, as showing that the causative germ is the same in all animals, the disease has been conveyed in the same way to the sow, ewe, goat, rabbit, and guinea pig, and mares, bitches, and cats can be infected if the virulence of the germ is intensified somewhat, as it appears to be by passing it through an intermediate host, such as the rabbit, instead of inoculating direct from the cow. Such experiments leave no room for doubt that the disease is a contagious one, and the conclusion is supported in a practical way by the beneficial results which follow on an antiseptic or germicidal method of treatment. In herds in which abortion has been prevalent for years the disease may be entirely suppressed by the adoption of this line of treatment.

The actual causative germ has not as yet been agreed upon. Organisms have been found by many investigators associated in the genital membranes, passages, or discharges in such a way as to indicate their connection with the disease, but different observers have ascribed the causative agency to germs showing differences in structure or other identifiable characters, so that no agreement has been arrived at. There is, however, a consensus of opinion that the germ propagates in the womb and genital passages.

Bang, of Copenhagen, claims to have isolated an organism from cases of abortion, by means of which, after artificial cultivation, he has produced the disease experimentally.

There are some interesting facts in connection with the experiments and observations made concerning this disease which have a practical bearing on its causation and prevention. One is, that in the experimental production of the disease the abortion usually occurs at from nine to twenty-one days from inoculation, but the period may be lengthened if the cow experimented on is in an early stage of pregnancy, or shortened if in a late stage. The period when abortion most often occurs is between the third and seventh month, so that if the infection is contracted at the time of "serving" it is evident that the period of incubation is longer than when it is conveyed experimentally, and hence no definite idea of the average period of incubation of the disease has been arrived at. The calves of aborting cows, if born alive, are usually delicate, and die of broncho-pneumonia or intestinal derangement within a few days of birth, and, as they are undoubted sources for the transmission of the disease, it will be safer in all cases to destroy them at birth, and burn the carcasses along with the membranes and discharges.

Temporary sterility is a condition often associated with the tendency to abort. The cow takes the bull at frequent intervals, and fails to conceive. In the 1904 annual report of the New Zealand veterinary branch there is reported

the case of a herd of thirty-two Shorthorn cows, the property of Archdeacon Williams, Te Aute, New Zealand, all of which had been barren for one to three years, as a result of an invasion of contagious abortion. In these cases there is apparently a chronic condition of catarrh of the womb, and, if conception does take place, abortion occurs within a few months. Cows that have once aborted are very liable to abort again if they conceive, although in some cases it has been noticed that after two or more abortions the animal appears to acquire an immunity against abortion, and will carry her calf the full period, even though cows that have not previously aborted are aborting all round. In cases of repeated abortion in the same cow, it has been observed that the calf is carried longer each time, until the full term is reached; but the presence in the herd of an aborting cow is such a menace to the remainder that it is unwise to give such a cow the chance to acquire immunity. She should be fattened for the butcher, and cleared off the place.

PREVENTION AND TREATMENT.

The disease being transmitted by some germ which propagates within the womb and genital passages, every cow that has recently aborted, or that shows signs of impending abortion, ought to be regarded as a disseminator of the disease; and the consequent necessity of complete isolation of such animals from the remainder of the herd is self-evident.

The success of the antiseptic or germicidal method of treatment will largely depend on the thoroughness with which the following details are carried out. As previously stated, the calf-membranes and discharges, as well as all litter soiled by these, should be destroyed by burning. If the cow has aborted in the paddock, it is absolutely essential that the fœtus should be searched for. If not found and burnt, it will certainly be "fossicked out" by other cows and infect them.

The womb and genital passages of the aborted cow should be irrigated with one of the following solutions:—

1. Carbolic acid, 1 part; sodium carbonate, 1 part; water, 100 parts.
2. Creolin or Lysol, 1 part; water, 100 parts.
3. Corrosive sublimate, 1 part; common salt, 10 parts; water, 2,000 parts.
4. Biniodide of mercury, 1 oz.; iodide of potassium, 4 oz.; water, 20 pints.

(No. 4 solution to be diluted, 1 part to 20 of warm water, when required for use.)

About a gallon of the antiseptic solution should be injected once daily for at least a week, and it is an advantage if it can be raised to blood heat before injection, so that the straining often induced by flooding with cold solutions may be avoided. An ordinary cattle enema syringe may be used, or a piece of hose piping may be inserted, and the solution poured or allowed to flow into it through a funnel, from a height sufficient to guarantee pressure enough to force the fluid into the furthermost recesses of the calf-bed. Where a number are to be injected, the solution may be kept in a barrel or vessel elevated on a framework, and the hose may have a pressure-cock attached to it, so that the amount of fluid injected may be regulated.

But the eradication of the disease will not be effected by the treatment of individual cows that have aborted, or even of those that fail to hold the bull. The whole of the cows, or, at all events, all the pregnant ones in the herd, must be subjected to similar treatment, for it must be borne in mind that when a cow aborts the germ has probably been propagating within the genital organs for some weeks previously, and that long before abortion actually occurs such a cow may be a disseminator of the disease by germs passed out with the discharges from the genital passages. In injecting pregnant cows, care must be taken that the fluid is not forced into the womb, but only so far as the neck

of that organ. One irrigation of pregnant cows will probably suffice, but until the outbreak has been completely overcome every cow in the herd ought to have the external parts and tail sponged daily with the germicide solution.

Aborted cows usually come "bulling" a few days after aborting, and, if then served, almost invariably abort again. Service should not be attempted for at least three months, during which time the germicidal treatment should be carried out.

The treatment of the bull that has been used with aborting or sterile cows is also an essential part of the eradication process. His sheath, and, if possible, the urethra of the penis, should be freely sluiced at intervals with the antiseptic solution. To do this effectively, and without danger, it will be necessary to have the bull in a crush-pen, with his legs shackled, or to throw him. An ordinary human enema syringe, such as may be procured at any chemist's, may be used to irrigate the sheath.

Finally, cleanliness in the milking-shed and suroundings is most important. The floors and lower parts of walls should be thoroughly cleansed at least once a week, and afterwards heavily sprinkled with bluestone (sulphate of copper), of a strength of 6 oz. to the gallon of water, or some other effective disinfectant.

It is important, and will prevent discouragement, to remember that no treatment is likely to completely rid a herd of the infection in the course of a single season, for when once a number of cases have occurred the disease is certain to be already in progress in the system of some of the remaining cows, although these may not at the time show any symptoms, and when the germ has gained access to the pregnant womb no remedial or preventive treatment can be efficacious. The treatment above sketched out must, therefore, be consistently carried out for two seasons, and the fact that a few cases occur during the second season need not excite despair.

As indicating the enormous monetary loss that may be suffered by allowing the contagious form of abortion to spread unchecked throughout a dairying country, the following statements by Mr. J. A. Gilruth, M.R.C.V.S., Chief Government Veterinarian of New Zealand, in an official bulletin on this subject, issued in 1905, may be quoted:—"I said last year that this disease was the cause of an annual loss of £100,000 to the colony (N.Z.). In the light of the fuller information since received, I now assert that the loss is more than twice that sum." And again:—"Our experience shows that this disease is costing the colony (N.Z.) from £200,000 to £300,000 per annum, an estimate based on the increased milk yield that would result from its eradication."

In Victoria, statistics as to the extent to which abortion and sterility prevail are not available, and estimates as to its prevalence in different districts vary considerably. Some herds are known to have been affected to the extent of 40 and 50 per cent., but an estimate of a 10 per cent. prevalence throughout the State would probably be very near the mark. Basing calculations on a 5 per cent. prevalence, however, it is found that the annual loss to the dairying industry through cows being out of profit from this disease approximates to £250,000 sterling.

NODULE DISEASE OF THE INTESTINES OF SHEEP.

"BARE-LOT" METHOD OF RAISING LAMBS.—RESULTS OF FURTHER EXPERIMENTAL WORK.

By W. H. DALRYMPLE.

The "bare-lot" method of endeavouring to raise lambs free from nodule disease of the intestines, while, at the same time permitting them to run with their diseased mothers, was first undertaken by the veterinary division of the

experiment station last year (1905), beginning the early part of February—when the in-lamb ewes were placed in the lot—and continuing until July, when the lambs were examined (*post-mortem*) for results, which latter have already been published in Station Bulletin No. 83.

In order to serve as a "link," however, between the work of last year and the outcome of that covered by this bulletin, we here reproduce our deductions, which we believe we were justified in making, as the result of the former:—

"(1) That, by the bare-lot method, it is possible to raise lambs, up to the period of weaning, and without separating them from their affected mothers, practically free from nodule disease of the intestines.

"(2) That, in the absence of intestinal parasites, other than the nodule-disease worm, lambs intended for feeding for the early, or other markets, may be raised in this way, without their health being impaired, or their general condition affected, by the disease.

"(3) That, in the case of ewe lambs to be kept for breeding purposes, and which may have become only slightly infested, there is the possibility, owing to the life-history of the parasite, as given by helminthologists (those who make a special study of worms), of auto-infestation and subsequent infection of clean pastures on which the lambs may have been placed.

"(4) That, although the previous deduction as to such possibility may be correct, there can hardly be any question as to the great reduction in the primary infestation by the bare-lot method, as compared to that brought about where the lambs are permitted to graze on pasture infected through the droppings of their diseased mothers.

"(5) That, the method is so simple and so free from technicalities, that any flockmaster who will take the trouble to observe ordinary care as to a few details, may obtain, at least, fair results from its adoption.

"(6) That, with the supply of some good vermifuge mixture to which the sheep can have access at all times, in conjunction with the bare-lot method, more satisfactory results might be looked for than was even obtained in our experiment.

"(7) That, when the lot becomes infected with other intestinal parasites, such as stomach worms, tape worms, &c., the method, alone, will not prevent infestation of the lambs with such parasites.

"(8) That, the method is worthy of trial by flockmasters owning breeding ewes affected with nodule disease of the intestines."

Owing to the results of the previous year's work—upon which the above deductions were based—showing a measure of practical success, and on account of encouraging comments upon the work, from various sources, and suggestions that duplicate, or other, tests be undertaken along similar lines, the station determined to carry on some further experimental work during the present year.

The lot (illustrated and described in Bulletin No. 83) was ploughed and harrowed, and all vegetation got rid of that had grown in the interim, and with the view of turning under any infection that might have remained over after the experiments of the previous year. The lot was then divided into halves by running a wire-net fence lengthwise, through it. Our object in making two lots was to duplicate the experiment of last year in one of the divisions, and in the other, to use common salt, as a vermifuge and tonic, in the feed of its occupants. In other words, the two lots, and the general treatment of the ewes and lambs were identical, with the single exception that common salt was mixed with the grain feed in one of the lots only.

Eight common native ewes of mixed breeding were purchased by the station from a flock that was known to be affected with nodule disease, and,

consequently, with the specific worm—*Oesophagostoma columbianum.* And not only so, but the ewes were afterwards found to be badly infested with both tape worms and stomach worms in addition, which, no doubt, militated to a considerable extent against our obtaining maximum good results, so far as the final outcome of the condition of the lambs was concerned.

From the eight ewes, five lambs were obtained, one being a twin and of undersize.

All of the lambs were born in the lots between 16th February and 5th March, 1906.

The ewes were equally divided, four being placed in each lot; the three oldest lambs, with their mothers, occupying the one in which the duplicate work of the previous year was undertaken, and which we will designate the "east lot." The remaining ewes, with the two youngest lambs, occupied the lot in which the salt was added to the feed, and which we will call the "west lot."

As the details of the plan of this work, with the exception of the added salt to the feed in one of the lots, are fully described in Station Bulletin No. 83, we may omit them here and refer the reader to that publication; and for a description of the disease itself to Station Bulletin No. 79.

In using a vermifuge, the idea at first was to provide, instead of salt, a mixture suggested in "Animal Parasites of Sheep," a publication of the National Bureau of Animal Industry, and composed of the following ingredients:—Pulverised rosin, 1 part; sublimed sulphur, 2 parts; air-slacked lime, 4 parts, and common salt, 16 parts. These materials were thoroughly mixed and placed in a small wooden box protected from the weather, and to which both ewes and lambs (in the west lot) could have access at all times. This may, doubtless, be quite a useful worm mixture, under ordinary circumstances, but, as the lambs were slow to voluntarily partake of it, and as it was thought possible that infestation might occur in them before they had acquired a taste for the mixture, it was decided to abandon its use and resort to the mixing of a small quantity of common salt alone with the grain feed twice daily, which we knew would be consumed with the food. Had we used the mixture in this way more favourable results might possibly have been secured.

The ewes were sold on 2nd August, 1906, and the lambs weaned and fed until 8th September, when they were butchered and examined.

Just previous to slaughter, the lambs from each lot were weighed. The weights of the three older ones which had occupied the east lot (without salt) aggregated 165 lb. The two younger lambs, taken from the west lot, where salt had been given, weighed, together, 133 lb.—"Louisiana Bulletin," No. 89.

REDWATER.

A correspondent sends us the following cure for redwater. He writes:—

The following is included in a list of "Cures for Various Diseases in Dairy Cattle," taken from "Mr. Wedge's Survey of Cheshire," and published in "The Freemasons' Magazine" for October, 1794:—"One well-recommended prescription is as follows, viz.:—A handful of salt and a handful of oatmeal, after being fried in a pan till they are hard and black, are given in a quart of cold buttermilk, the beast being kept from food some little time before and after giving it. This dose, once or twice administered, will, it is said, remove the complaint if it is not too long neglected; should the cow be bound after this medicine, as frequently happens, stiff oatmeal gruel, about 2 quarts at a time, should be given twice or thrice a day till that complaint is removed."

General Notes.

QUEENSLAND BEE-KEEPERS' ASSOCIATION.

At the request of the above association, whose object is to encourage bee-keepers in this State to exhibit their products at shows, and to create a confidence that honey will be judged correctly, the following list of competent judges, as selected and approved of by the association, is published for the information of those interested in apiculture and honey production:—

Messrs. H. L. Jones and J. C. Russell, Hemmant;
R. J. Cribb, Milton; F. Wilson Smith, 275 Albert street, Brisbane;
G. Butler, Red Hill; F. Chippendale, Southport; W. H. Dunsdon, Toowoomba; G. F. Fletcher, Warwick.

WEIGHTS AND MEASURES.

Two tablespoonfuls liquid equal 1 oz. One tablespoonful salt equals 1 oz. One heaping tablespoonful brown or granulated sugar equals 1 oz. Two tablespoonfuls powdered sugar equal 1 oz. One heaping tablespoonful sifted flour equals 1 oz. Three tablespoonfuls grated chocolate equal 1 oz. Four tablespoonfuls liquid equal 1 oz. Four tablespoonfuls liquid, equal one wine-glass. Two wine-glasses equal 1 gill. Twenty-five drops equal 1 tea-spoonful. One quart wheat flour equals 1 lb. Ten ordinary eggs equal 1 lb.—"The Housekeeper."

A STATE'S PROGRESS.

Governor Glenn, in a recent address at Charlotte, made the following statement, which indicates the modern development of the South:—

We now have in North Carolina 3,000,000 people when we had only 900,000 thirty-six years ago. Our wealth has increased from 260,000,000 dollars to 1,000,000,000,000 dollars; our debt has been reduced from 40,000,000 dollars to absolutely nothing. We have 10,000,000 dollars assets with which to meet outstanding obligations of 6,000,000 dollars. Thirty-six years ago we had no spindles to speak of ; no roads; we were known as the Rip Van Winkle State. Now all this has changed. Five years ago North Carolina stood third in cotton manufacturing in the United States; now we stand second, and two years from now we shall be first.—"Florida Agriculturist."

A WONDERFUL REMEDY FOR SPRAINS.

The white of one egg beaten stiff and stirred with salt (it should be the consistency of frosting for cake). Bind it on to the affected part and renew as often as it becomes dry. It works like a charm.

TO GET RID OF RATS.

A farmer, writing to "The Florida Agriculturist," says that he rids his farm of rats in the following manner:—"On a number of pieces of shingles I put out about a teaspoonful of molasses, and on that I put a small quantity of concentrated lye, and then put the old shingles around under the cribs. The next morning I found some forty dead rats, and the rest left for parts unknown. I have learned several farms have been rid of the pests in the same way, and never knew it to fail." We hope some of our readers will try it and report.

ROMNEY MARSH SHEEP.

Mr. Charles Whitehead, a few years ago, called attention to a peculiar habit of the Kent or Romney Marsh sheep, which, he claimed, fits them in a special degree for grazing marshes:—"Kent sheep always feed singly. On being put into a pasture they immediately disperse all over it, and feed it down evenly and thoroughly, whereas Downs and sheep of other breeds feed in groups, and make bare paths in all directions by their 'follow-the-leader' habits." This habit, no doubt, is an outcome of the conditions of life. Sheep which pick up a living on comparatively poor pasture would acquire the habit of scattering in search of food. Sheep reared on rich pastures are under no such necessity.

CARAVONICA COTTON.

The following is an extract from a letter from Messrs. Wolstenholme and Holland, of Liverpool, to the British Cotton-growing Association, dated 28th December, 1906:—In reply to your inquiry, the Caravonica cotton referred to sold at 9d. per lb., and the owner has been offered 9½d. for the following crop, which is now worth 10d., owing to the present scarcity of Peruvian.

WATER IN BUTTER.

A witness before the British Butter Committee described a machine which causes globules of fat and of water to coalesce, so that butter with 50 per cent. of water can be made to show no more water than ordinary butter with 14 per cent.

AGRICULTURAL COLLEGE OLD BOYS' CLUB.

The following subscriptions have been received by the secretary to date, 31st May, 1907:—

F. Bray, J. O. Murray-Prior, E. F. Youngman, F. H. Boase, F. Calcino, H. May, M. Shield, A. Smart, R. E. Soutter, H. W. Nuttall, C. D. Handley, H. A. Hillcoat, 5s. each. A. Smart 4s. 6d. (exchange on cheque omitted).

A. J. Boyd, Secretary and Treasurer.

As several members of the club have changed from one district to another, the secretary would be glad if all the members would forward their present address to him as early as possible.

THE UNITED MARANOA FARMERS' ASSOCIATION.

This association has carried out an idea which we have often advocated in this Journal. Its object is to consolidate into a head association the several farmers' associations—but without fusion—that is to say, that individuality of the latter is maintained. Four associations have already affiliated—viz., Warooby, Yingerbay, Euthulla, and Wallumbilla—and two others are expected to join later on. Each association sends three delegates to attend the meetings. The subscription *pro tem.* is fixed at 10s. per annum for each association.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

TANNING SKINS.

W. WALLACE, Goodwood—

In reply to your question *re* tanning marsupial skins, the following is a good recipe. Recipes were given in the February and July issues of the Journal in 1899:—

The general principle is to trim off the useless parts of the skin and remove all fat from the inside. Then soak the skin in warm water for about an hour. Then apply a coating of borax, saltpetre, and Glauber's salts, 1 oz. of each dissolved in sufficient water to make a thin paste. The following day give a coating of a mixture of 1 oz. of sal. soda, ½-oz. of borax, and 2 oz. of hard soap. This mixture should be slightly heated, without allowing it to boil. After this, fold the skin together, and leave in a warm place for 24 hours. Then take 4 oz. of alum, 3 oz. of salt, and 2 oz. of saleratus; dissolve these in hot water, and when cool soak the skin in it for 12 hours; wring out and hang up to dry. If you find the skin not sufficiently soft, repeat the soaking and drying two or three times.

ANOTHER METHOD.

Remove the flesh and fat, then wash the skin in a solution of sal. soda and water. Take 4 oz. of pulverised alum, 8 oz. of salt, 1 quart new milk to 4 gallons of salt water, 1 pint of prepared starch. Stir well, and then put in your fur skins, and air them often by hanging them over a stick laid across your tan tub, so they will drain the liquor back into the tub; handle this occasionally until they have been in the liquor a day or two. Then remove the skins, and add to your liquor a *half* teaspoonful of sulphuric acid. Stir this well into the liquor. Put the skins back and steam them well for about an hour; then take them out, and wring and rinse off in soft, luke-warm water, and hang them up in a cool place, and when they begin to get white work and stretch them till they are dry. Hides of large animals (kangaroos, for instance) should remain longer in the solution.

SALT AS A REMEDY FOR THE CANE GRUB.

H. MERZ, Nelson, Cairns—

Question 1.—Is common salt, when applied to the soil in planting cane, a check on grubs?

Question 2.—How much salt should be applied per acre?

Question 3.—Is common salt a manure of itself?

Question 4.—If applied with manure, would it be beneficial to the latter?

These questions have been submitted to Mr. H. Tryon, Entomologist, who has supplied the following answers:—

Amongst other substances that are reported to be baneful to the grub is common salt. A "light dressing" of this applied in the furrows has been resorted to in dealing with the Bundaberg variety of the pest by Mr. W. G. Farquhar, of the Hummock Plantation. It has, however, been proved experimentally by the writer that little or no benefit may be expected from its application, except in such quantities as would involve a large monetary outlay, and would also modify the soil injuriously from the point of view of the conditions necessary for successful cane growth. Salt applied directly to the grubs will irritate them, cause them to disgorge food, and may ultimately kill them, as will also a strong aqueous solution of the same substance; but, if previously uninjured, they will tolerate a free admixture of salt in the earth in which they live, whilst they are quite indifferent to the presence of an amount equal to that which would be exhibited in the case of a mineral fertiliser. Mr. H. Jane, formerly resident at Glendarra, resorted to the employment of salt

mixed with ashes, for the purpose of destroying these pests, some ten years since. No marked results, however, followed its application, and the outlay that it involved was very considerable. Mr. J. C. Brünnich (now Chemist, Department of Agriculture), the well-known chemist of Homebush, has tried the effect of salt also, but in the canefield on an area occupied by several grub-infested stools. This was in April and May, when the pests were feeding near the surface. He employed an aqueous solution of about 10 per cent., and used it in sufficient quantity to soak the soil to a depth of 6 inches, notwithstanding it exerted no appreciable influence upon the grubs, though it evidently affected the cane plants themselves prejudicially. Common salt has also been tried in the United States with a view to effect the destruction of the white grub previously referred to, but without any beneficial results (G. H. Perkins, Fifth Annual Report of the Vermont State Agricultural Experiment Station, p. 153). Similarly its efficacy has been tested in Ceylon for the purpose of coping with the larvæ of Scarabaeid beetles, that formerly injured the coffee plants there, but in this case also without any benefit accruing (J. Nietner, "Coffee and its Enemies," Colombo, 1887).

To questions 3 and 4, I can only reply by referring to text-books on Agricultural Chemistry. Salt is not a manure by itself—that is, as a direct provider of plant food. It is classed, however, as an "Indirect Manure." It may be applied with certain classes of manure with direct benefit thereto, having in view the purposes for which this is used. In the case of beet-root cultivation it has been known to lessen the yield of sugar by the crop (*vid.* C. M. Aikman, "Manures and the Principles of Manuring," chap. 21). Apart from its use for grub destruction, and that is counter-indicated, its employment as an indirect manure is altogether dependent on local soil conditions. Accordingly, Mr. Merz had better consult a chemist with regard to this question who is quite familiar with these—*e.g.*, Mr. L. Nott, the Chemist of the Mulgrave Mill, with whose high attainments he is doubtless already familiar.

[To the above we will add that methodical experiments have shown that sodium compounds (of which common salt is one—*i.e.*, chloride of sodium—are apparently not essential to the life of agricultural plants. Crops grow perfectly well without it. The verdict of practical men is unfriendly to the use of salt. Salt has been mixed with Peruvian guano to hinder grain crops from running to straw in wet seasons. A barrel of salt to the acre, for wheat, is one English formula. One successful American planter says that 300 lb. of salt and 200 lb. of plaster are almost a total preventive of rust in wheat. It acts as a preservative, by hindering fungi from acting on manure. Dressings of lime and salt are fatal to snails and slugs, and will kill the millipede *(Julus guttatus)* rapidly. Miss Ormerod, in her "Text-book of Agricultural Entomology," expressly mentions the sugar-cane chafer *(Pentodon fossator)* of Trinidad. After mentioning such remedies as deep ploughing, collecting by the help of children, and destroying by the help of pigs on unoccupied ground, she says: "There is, however, another treatment not nearly enough thought of, which is applicable to all infected land free of crop, and that is, by putting on a heavy killing dressing of caustic gas-lime or alkali waste. Both at first destroy all plant and insect life. When either has done its first work in the caustic state, the action of the air gradually turns the poisonous properties to sulphate of lime, and they become a good manure of the nature of gypsum." As far as the cane grub is concerned, she says: "This is one of the classes of attacks which we can at present only hope to meet by special observations to decide: Where do the beetles feed? What kind of soil do they frequent? Are they attracted by farm manure? This is a very important point, for the grubs of one or more kinds will leave preying on the roots to feed in manure, and it is possible this may attract the chafers for egg-laying." Miss Ormerod recommends the sowing of salt at the rate of 5 to 8 cwt. per acre.—Ed. "Q. A. J."]

FOURCROYA *V.* SISAL.

I.S.V., Maranoa.—

If you intend growing sisal hemp on the coast land, it would be well to plant the true sisal *(Agave rigida,* var. Sisalana*)*. But there is no reason why you should not plant the Mauritius hemp *(Fourcroya gigantea)*. The fibre is usually £5 per ton less in price than that of the sisal, but, on the other hand, a crop can be taken off within four years. The leaves run to 9 feet in length. After the first crop, a second can be harvested ten months later, and a third in fifteen months, and so on every succeeding eighteen months until the plant seeds. One acre will yield 60,000 leaves, yielding 1 ton of dry marketable fibre, worth in the London market from £29 to £33 per ton. There is a very large demand for fibre, both in Australia and in Europe and the United States. Even the waste from the machines, usually thrown away, is now worth £5 per ton.

Times of Sunrise and Sunset, 1907.

Date.	May.		June.		July.		August.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·13	5·17	6·30	5·1	6·39	5·3	6·30	5·18
2	6·14	5·16	6·31	5·0	6·39	5·4	6·30	5·19
3	6·14	5·15	6·31	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·29	5·20
5	6·15	5·14	6·32	5·0	6·39	5·5	6·28	5·20
6	6·16	5·13	6·32	5·0	6·39	5·5	6·27	5·21
7	6·16	5·12	6·33	5·0	6·39	5·6	6·27	5·21
8	6·17	5·12	6·33	5·0	6·39	5·6	6·26	5·22
9	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
10	6·18	5·10	6·34	5·0	6·39	5·7	6·24	5·23
11	6·18	5·10	6·34	5·0	6·39	5·7	6·24	5·23
12	6·19	5·9	6·35	5·0	6·39	5·8	6·23	5·24
13	6·20	5·8	6·35	5·0	6·38	5·8	6·22	5·24
14	6·20	5·8	6·36	4·59	6·38	5·9	6·21	5·25
15	6·21	5·7	6·36	4·59	6·38	5·9	6·20	5·25
16	6·21	5·7	6·36	5·0	6·38	5·10	6·19	5·26
17	6·22	5·6	6·37	5·0	6·37	5·10	6·18	5·26
18	6·23	5·6	6·37	5·0	6·37	5·11	6·18	5·27
19	6·23	5·5	6·37	5·0	6·37	5·12	6·17	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·16	5·28
21	6·24	5·4	6·38	5·0	6·36	5·13	6·15	5·28
22	6·25	5·4	6·38	5·1	6·35	5·13	6·14	5·29
23	6·25	5·3	6·38	5·1	6·35	5·14	6·13	5·29
24	6·26	5·3	6·38	5·1	6·35	5·14	6·12	5·30
25	6·26	5·2	6·39	5·1	6·34	5·15	6·11	5·30
26	6·27	5·2	6·39	5·2	6·33	5·15	6·10	5·31
27	6·27	5·2	6·39	5·2	6·33	5·16	6·9	5·31
28	6·28	5·2	6·39	5·2	6·32	5·16	6·8	5·32
29	6·28	5·1	6·39	5·3	6·32	5·17	6·7	5·32
30	6·29	5·1	6·39	5·3	6·31	5·17	6·6	5·32
31	6·30	5·1	...	...	6·31	5·18	6·5	5·33

Phases of the Moon.

			H. M.
5 May	☽	Last Quarter	7 53 a.m.
12 „	●	New Moon	6 59 p.m.
20 „	☾	First Quarter	11 27 „
28 „	○	Full Moon	0 18 a.m.
3 June	☽	Last Quarter	3 20 p.m.
11 „	●	New Moon	9 50 a.m.
19 „	☾	First Quarter	0 55 p.m.
26 „	○	Full Moon	7 27 a.m.
3 July	☽	Last Quarter	0 34 a.m.
11 „	●	New Moon	1 17 „
18 „	☾	First Quarter	11 12 p.m.
25 „	○	Full Moon	2 29 „
1 Aug.	☽	Last Quarter	0 25 p.m.
9 „	●	New Moon	4 36 „
17 „	☾	First Quarter	7 5 a.m.
23 „	○	Full Moon	10 15 p.m.
31 „	☽	Last Quarter	3 28 a.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1907.	Rockhampton.		Townsville.		Cooktown	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
May	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June	1 m.	19 m.	10 m.	44 m.	7 m.	55 m.
July	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.
August	5 m.	15 m.	18 m.	36 m.	16 m.	46 m.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	MAY. Prices.
Apples, Eating, Local, per packer	...
Apples, Cooking, Local, per packer	...
Apricots, Local, per packer	...
Bananas, Local, per dozen	...
Bananas, Local, per bunch	6d. to 1s.
Bananas, Fiji, per case	...
Custard Apples, per quarter-case	2s. 6d. to 4s.
Cape Gooseberries, per quart	...
Grapes, per lb.	..
Lemons, Local, per packer	2s. 6d. to 6s.
Mandarins, Local, per packer	3s. 6d. to 5s.
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges, per packer	2s. to 3s.
Papaw Apples, per case	...
Passion Fruit, per quarter-case	...
Peaches, per case	...
Peanuts, per lb.	...
Pears, Imported, per case	...
Persimmons, per case	...
Pineapples (rough leaf), per dozen	...
Pineapples (smooth leaf), per dozen	...
Plums, quarter-case	...
Quinces, per case	...
Rockmelons, per dozen	...
Rosellas, per bag	1s. to 1s. 3d.
,, per quarter-case	6d. to 9d.
Strawberries, per tray	...
Tomatoes, per quarter-case	1s. to 1s. 6d.
Watermelons, per dozen	...
SOUTHERN FRUIT MARKET.	
Apples, per case	...
,, Tasmanian, per case	...
Bananas, Queensland, per case	5s. 6d. to 6s.
,, ,, per bunch	1s. 6d. to 2s.
,, Fiji, per case	12s. 6d. to 13s. 6d.
,, ,, per bunch	4s. to 9s.
Chillies, per bushel	...
Grapes, per box	...
Lemons, Ordinary, per gin case	...
,, Medium to good, per gin case	...
,, Extra choice ,, ,,	...
Mandarins, per case	2s. 6d. to 4s. 6d.
Oranges, Local, per case	3s. to 5s.
Pears, per box	...
Persimmons, per half-case	2s. 6d. to 4s. 6d.
Pineapples, per case	...
,, choice, per case	...
,, small ,,	...
Passion Fruit, per gin case	...
Strawberries, per dozen punnets	...
Tomatoes, per half-case	2s. 6d. to 4s.
Watermelons, Queensland, per dozen	...
,, medium	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MAY.

Article.		MAY. Prices.
Bacon (Pineapple)	lb.	7½d. to 9½d.
Barley (Malting)	...	...
Bran	ton	£4 15s. to £5.
Butter, Factory	lb.	9½d.
Chaff, Mixed	ton	£4 to £4 15s.
Chaff, Oaten	„	£4 to £4 5s.
Chaff, Lucerne	„	£4 15s. to £5 10s.
Chaff, Wheaten	„	£2 17s. 6d.
Cheese	lb.	5¾d. to 6d.
Flour	ton	£7 15s. to £8.
Hay, Oaten	„	£5.
Hay, Lucerne	„	£4 to £4 10s.
Honey	lb.	1¾d. to 2d.
Maize	bush.	2s. 8d. to 2s. 9½d.
Oats	„	2s. 11d. to 4s. 9d.
Pollard	ton	£5 to £5 5s.
Potatoes	„	£3 15s. to £4 15s.
Potatoes (Sweet)	„	...
Pumpkins	„	...
Wheat, Milling	bush.	3s. 6d. to 3s. 8d.
Wheat, Chick	„	2s. 6d. to 3s.
Onions	ton	£4 to £4 10s.
Hams	lb.	10d. to 10½d.
Eggs	doz.	1s. 1½d. to 1s. 4½d.
Fowls	pair	1s. 7d. to 2s. 3½d.
Geese	„	4s. 1d.
Ducks, English	„	2s. 1½d. to 2s. 4d.
Ducks, Muscovy	„	2s. 4d. to 2s. 9d.
Turkeys, Hens	„	...
Turkeys, Gobblers	„	10s.

ENOGGERA SALEYARDS.

Animal.	APRIL. Prices.
Bullocks	£8 10s. to £10 17s. 6d.
„ (Extra)	£12 to £14 15s.
Cows	£7 5s. to £9 15s.
Merino Wethers	21s. 6d.
C.B. „	26s.
Merino Ewes	18s.
C.B. „	22s.
Lambs	16s.
„ (Extra)	22s. 9d.
Pigs (Good Porkers)	35s. 6d.

Farm and Garden Notes for July.

FIELD.—The month of July is generally considered the best time to sow lucerne, for the reason that the growth of weeds is practically checked, and the young lucerne plants will, therefore, not be choked by them, as would be the case if planted later on in the spring. If the ground has been properly prepared by deep ploughing, cross-ploughing, and harrowing, and an occasional shower occurs to assist germination and growth, the lucerne will thrive so well that by the time weeds once more appear it will be able well to hold its own against them. From 10 to 12 lb. of seed will be sufficient for an acre. This is also the time to prepare the land for most field crops, such as potatoes, maize, oats and barley, rye, vetches, tobacco, cotton, sugar-cane, field carrots, mangolds, swedes, canaigre, &c. Early potatoes, sugar-cane, and maize may be planted in very early districts, but it is risky to plant potatoes in this month in any districts liable to late frosts, and in low-lying ground it is better to wait till the following month. The greatest loss in potatoes and sugar-cane has been experienced in September, when heavy frosts occurred in low-lying districts in the Southern portion of the State. During suitable weather, rice may be sown in the North. The coffee crop should now be harvested, and yams and turmeric unearthed.

KITCHEN GARDEN. Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. Never walk over the land during wet weather with a view to sowing. The soil cakes and hardens, and good results cannot then be expected. This want of judgment is the usual cause of hard things being said about the seedsman. In fine weather, get the ground ploughed or dug, and let it lie in the rough till required. If harrowed and pulverised before that time, the growth of weeds will be encouraged, and the soil is deprived of the sweetening influences of the sun, rain, air, and frost. Where the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, mustard, and cress, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts, it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities, it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

FLOWER GARDEN.—Winter work ought to be in an advanced state. The roses will now want looking after. They should already have been pruned, and now, any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up sown plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, coxcombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, poncratium, ismene, crinums, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

Orchard Notes for July.

By ALBERT H. BENSON, M.R.A.C.

The remarks that have appeared in the Orchard Notes for the last three months anent the handling, packing, and marketing of citrus fruits apply equally to the present month.

The pruning of all kinds of deciduous fruit trees should be completed during the month. All prunings should be gathered and burnt, and the tree should then receive a thorough spraying with the lime, sulphur, and salt wash, which is the best all-round winter spray, acting both as an insecticide and a fungicide. After pruning and spraying, the orchard should be well ploughed, so as to bury all weeds and trash that may have accumulated, to sweeten the soil, and to break up any pan that may have been formed by summer cultivation.

Citrus trees, from which the fruit has been gathered, should be pruned now, the pruning to consist of cutting out all dead branches or branches having borers in them, as well as all branches, thorns, or twigs, growing in the centre of the tree which are not required. The centre of the tree must be kept well opened up, as, unless this is done, the superfluous wood only forms a harbour for all kinds of insect and fungus pests, and, in addition to this, where the tree is not well pruned out in the centre, it is impossible to do good work with the spray pump.

As already stated, all the prunings from the tree should be gathered and burnt, as this is the surest way of destroying any scale insects, borers, or fungus pests with which they may be infected. If you have no spray pump, then the above mixture should be applied with a brush. It will destroy all scale insects with which it comes in contact, and will remove all moss and lichen as well as stop the spread of canker or bark rot.

The planting of deciduous trees can be continued throughout the month, but it is not advisable to delay it more than can be helped, as when the trees are planted, even though they make no leaf or wood growth, they begin to throw out adventitious rootlets which are ready to start work as soon as the first top growth takes place. Don't plant too deep: the depth at which the young trees stood in the nursery is the right depth; trim the roots carefully, so as to remove all bruised portions; spread the roots out well, so that they may get a good hold of the ground, and always spread a little fine top soil round them, as this will be conducive to the rapid formation of new roots.

Cut back hard at planting, and don't be afraid that you will spoil your tree by doing so. Failure to cut hard back prevents the formation of a strong, well-grown, symmetrical tree, and always tends to injure the future vigour and growth of the tree.

See that all trees that are planted, whether deciduous or evergreen, are free from pests, as it is much easier to keep disease out of the orchard by planting clean trees than it is to stamp out disease once it has got a fair hold. Where the trees are infested with scale insects of any kind, they should be treated by hydrocyanic acid gas, as recommended and described from time to time in this Journal. If this treatment of the young trees is carefully carried out, there is every chance of their remaining clean for a considerable time after they are planted.

Do not plant rubbish; only plant those trees that your soil and climate are adapted for. Do not try to grow fruits that will only end in failure, as no grower who is dependent on fruit culture for his living can afford to grow fruits that can be produced both better and cheaper by others under more suitable conditions; but he must confine his energies to the culture of those fruits that prove a commercial success.

It costs just as much to prepare the land for and to plant, prune, spray, manure, cyanide, and generally look after an inferior variety of fruit tree, or a variety of fruit tree that is unsuitable to the climate, and from which no return of any value can ever be obtained, as it does to grow a variety that is suitable to the soil and climate, that will produce superior fruit, and for which there is always a ready sale. Therefore, I again repeat that no grower who is dependent on fruit culture for his living can afford to spend time or money in the growing and looking after unsuitable varieties of fruit trees.